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SUSQUEHANNA RIVER BASIN COMMISSION

DEC 24, 1970

COMPREHENSIVE PLAN FOR MANAGEMENT AND DEVELOPMENT OF THE WATER RESOURCES OF THE SUSQUEHANNA RIVER BASIN

ADOPTED
DECEMBER 13, 1973

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SUSQUEHANNA RIVER BASIN COMMISSION

COMPREHENSIVE PLAN
FOR MANAGEMENT AND DEVELOPMENT OF THE WATER RESOURCES OF THE SUSQUEHANNA RIVER BASIN

ADOPTED

DECEMBER 13, 1973

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SUSQUEHANNA RIVER BASIN

COMPREHENSIVE PLAN

PREFACE

The Susquehanna River Basin Compact requires the formulation of a comprehensive plan for the immediate and long-range use, management and development of the water and related land resources of the basin. The plan is to be dynamic and responsive to many facets of public interests, changing needs and demands and new findings, and will be in the form, scope and detail determined by the Commission to be most effective to assure the best possible management and development of the basin's water resources.

The Commission intends that the plan remain flexible in order that it may be responsive to the changing economic, social and environmental interests and demands of the people of the basin and the nation. It follows that at no point in time will the plan be considered final, but as necessary it will be expanded and directed toward various problems.

The plan is founded on broad multiple objectives, goals, guidelines, criteria and programs designed to integrate all related water and land resource problems and programs. The methods and means by which the objectives, goals, and programs are achieved can be expected to change due to new techniques and findings. The rate at which they will be achieved depends on the level of resource commitment and of government and private investment. Therefore only the most basic of these plan components are included in the plan at this time. Additions and/or changes to the plan will result through continued resource planning.

The comprehensive plan includes existing projects and authorized projects that are under construction, in addition to proposed programs. It outlines parameters and constraints and means to coordinate, direct and review public and private planning, management, and development of the water resources of the basin. The Commission recognizes the substantial amount of planning that has been done by Federal, Interstate, State, local and private entities and does not intend to duplicate this work. The Susquehanna River Basin Coordinating Committee Study, a joint effort of Federal - State agencies, is currently being evaluated by the Commission. Other efforts of the signatory States, regional and county planning agencies, and the private entities are also being evaluated for possible inclusion in the plan.

The plan emphasizes nonstructural measures, such as flood plain management and resource conservation, as urgently needed steps to reverse land and water use trends that, if allowed to continue unchecked, may cause irreversible resource degradation or lead to pressure for solution by structural means. Some proposed structural measures on which studies are sufficiently advanced are included at this time for consideration. However, many proposals presented in previous studies need reevaluation and are not included. These and all new proposals will be carefully evaluated in terms of their net benefits and overall impact on the environment, and the findings made subject to public review so that irreversible actions or those which might preclude an alternative solution can be thoroughly considered before final decisions are reached.

The plan and its elements will require periodic appraisals by the Commission and the public. The Commission's Annual Water Resource Program will be based on the comprehensive plan. This annual program will provide one of the means for continuous appraisal of the plan and its elements, to assure that progress is being made in meeting needs and solving the water resource problems of the basin.

The following is the plan of the Commission, as well as background information to assist in understanding what the Commission is and the course it will pursue in the development of the water resources of the Susquehanna River Basin. Views of governmental units, private interest groups and individual citizens are needed by the Commission, so that conflicting and complementing uses of the basin's resources may be assessed and a balance struck to accommodate the best overall recommendations.

The importance of broad input from all sources of outside interest cannot be overstated. The comprehensive plan forms the framework for the conservation, management, development and use of the basin's water resources and will, therefore, have a continuing impact on the future of the basin's population and their governing bodies.

PART I

INTRODUCTION

SECTION I - BACKGROUND INFORMATION

In the early 1960's, citizen concern regarding water resources problems in the Susquehanna River Basin - flooding, drought, and water pollution - stimulated the formation of the Susquehanna River Basin Association, a citizens' organization.

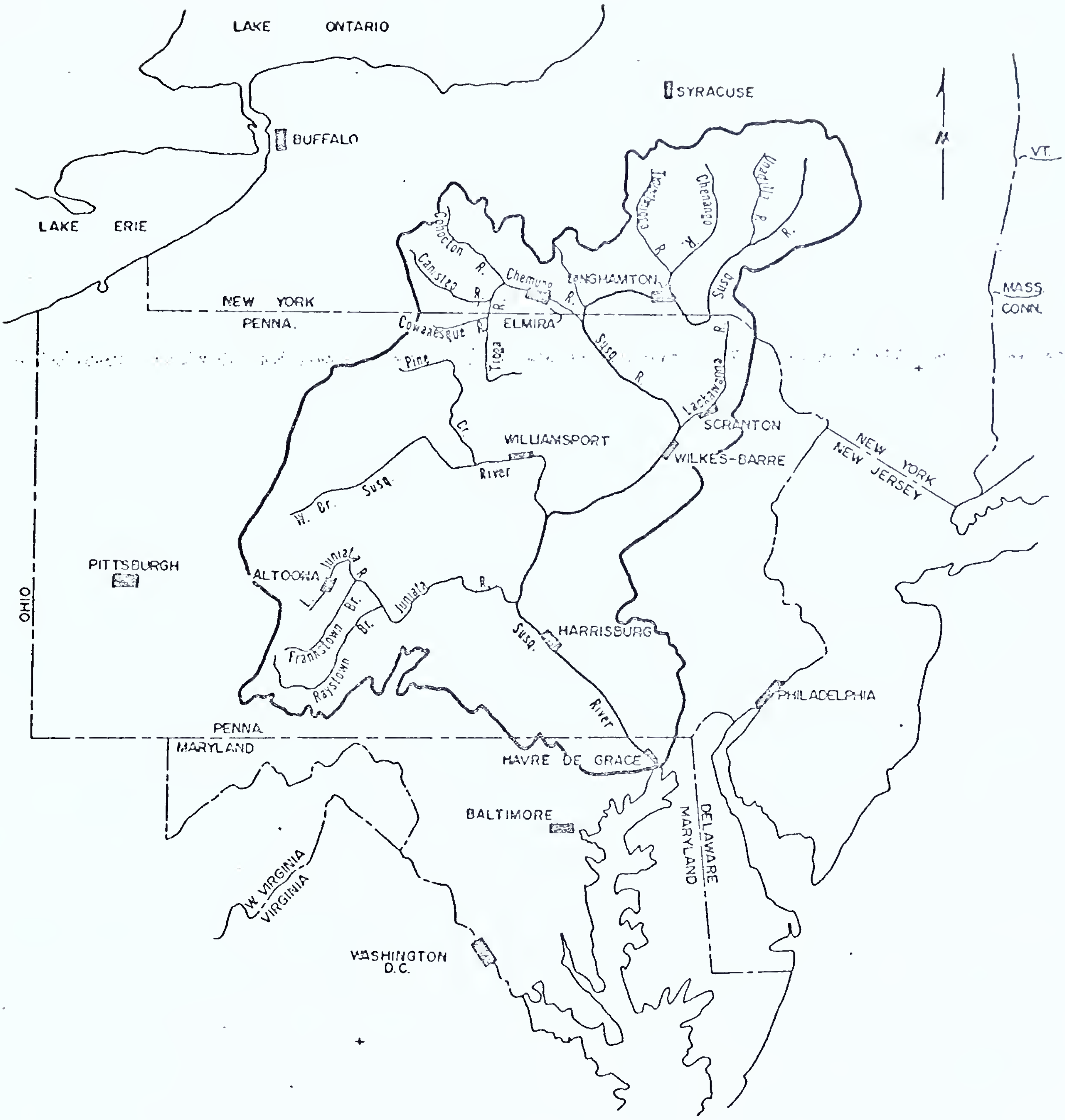
The Association and other groups, including all levels of government, expressed the need for comprehensive river basin studies to develop solutions to resource problems in the basin. (See Figure 1)

As the Susquehanna River system is interstate, it was considered desirable to have some type of regional government institution to deal with water resources problems, and to implement management measures on a basinwide basis.

The Congress of the United States recognized a national interest in the Susquehanna River Basin, and in 1962 authorized and funded a comprehensive study of the water resources of the basin. The Baltimore District of the U.S. Army Corps of Engineers was assigned to chair this study which was completed in 1970. Concurrently, citizen and State activities led to the creation of an Interstate Advisory Committee for the Susquehanna River Basin, with membership derived from the States of New York, Pennsylvania, and Maryland.

This Committee began functioning in 1963, and after much study and deliberation concluded that a regional approach to development issues of the basin was advisable, feasible and urgently needed. The Committee thus drafted a Federal - Interstate Compact for the comprehensive planning, management, development, use and conservation of the water resources of the basin, and recommended that the Compact be adopted by the member States and the Federal government.

The President of the United States signed the Susquehanna River Basin Compact into law December 24, 1970, subsequent to its approval by Congress and the prior approval of the involved States. The Compact provided for the creation of a single administrative agency to coordinate water resources efforts and programs of Federal, State, local and private interests in the basin. Within a few months of the signing of the Compact the signatory parties established the Susquehanna River Basin Commission as the administrative agency.



THE SUSQUEHANNA RIVER BASIN COMMISSION

UNITED STATES·NEW YORK·PENNSYLVANIA·MARYLAND

THE SUSQUEHANNA RIVER BASIN

FIGURE NO. 1

SECTION II - THE SUSQUEHANNA RIVER BASIN COMMISSION

A. Membership

The members of the Commission shall be the governors of the signatory States or their designees and an appointee of the President of the United States. Each member may appoint an alternate to serve and act on his behalf and at his pleasure. A full-time staff serves the Commission.

B. Role of the Commission

To meet its mandated duties and accomplish the purposes and goals set forth in the Compact, the Commission will coordinate basinwide water resources planning by formulating, adopting and implementing a comprehensive plan for the basin. Inherent in this process is the coordination of the planning efforts of others affecting water resources, stimulation of public awareness, and the implementation of related action programs. The Commission will serve as a water resources project development, management and operation agent, as it determines necessary. As the need is demonstrated, it will develop a capability for coordination and management of the funding and conduct of public works programs and projects in the basin.

In its role as coordinator of basinwide water resources planning, the Commission will seek to integrate planning done at the Federal, State and local levels of government with that done by the private sector. It will seek to provide opportunity for all interest groups to express their views and to reconcile differences between groups when possible.

Further evidence of the Commission's leadership role in basin development will be exerted through its project review function. This function will be oriented towards the evaluation of projects and proposals for development, use, and management of the water resources of the basin in terms of their planning and program objectives as well as the goals set forth in the plan, and on the basis of a comprehensive public viewpoint in terms of project effects. This public viewpoint will be sought through public hearings, informal contacts, and through views formally expressed to the Commission.

Some examples of projects and programs to be considered under project review will be: allocations, withdrawals, and diversions of water; development of nonstructural and structural measures for flood damage reduction, water supply storage, low flow augmentation, and water related recreation; water quality standards and their application; and protection and preservation of natural amenities.

It should be noted that the role of the Commission in any given endeavor will vary according to the extent others act to meet the overall goal of optimum development of the basin's water resources. Where the Commission determines that existing programs of others do not meet identified demands it will act to encourage the appropriate signatory or signatories to accelerate programs, reorder priorities or establish new programs. The Commission also may act directly to meet demands through the exercise of powers granted it by the Compact.

C. Duties and Powers

Extensive duties are required of the Commission and can be briefly outlined as follows:

1. Develop and effectuate plans, policies, and projects relating to water resources; adopt, promote, and coordinate policies and standards for water resources conservation, control, utilization, and management; and promote and implement the planning development, and financing of water resources projects.

2. Undertake investigations, studies, and surveys, and acquire, construct, operate, and maintain projects and facilities in regard to the water resources of the basin whenever it is deemed necessary to do so to activate or effectuate any of the provisions of the Compact.

3. Administer, manage, and control water resources in all matters determined by the Commission to be interstate in nature or to have a significant effect on the water resources and water resources management.

4. Assume jurisdiction in any matter affecting water resources whenever it determines, after investigation and public hearing upon due notice given, that the effectuation of the comprehensive plan or the implementation of the Compact so requires. If the Commission finds upon subsequent hearing requested by an affected signatory party that the party will take the necessary action, the Commission may relinquish jurisdiction.

5. Investigate and determine if the requirements of the Compact or the rules and regulations of the Commission are complied with, and if satisfactory progress has not been made, institute an action or actions in its own name in any State or Federal court of competent jurisdiction to compel compliance with any and all of the provisions of the Compact or any of the rules and regulations of the Commission adopted pursuant thereto.

The necessary authority to act on these duties is delegated to the Commission by the Compact signatories, as are such other and different powers which are necessary or convenient to carry out its express purposes, or purposes which may be reasonably implied therefrom.

It is clearly presented in the Compact that the very extensive authority granted the Commission is conditioned to preserve and utilize the functions, powers and duties of existing offices and agencies of the signatory parties to the extent consistent with the Compact.

PART II

THE PLAN

SECTION I - AUTHORITY, PURPOSE, SCOPE, PLAN DEVELOPMENT

A. Authority

Sections 3.3 and 14.1 of the Compact authorize and require that the Commission formulate and adopt a comprehensive plan for the immediate and long-range development and use of the water resources of the basin. The Commission may adopt a comprehensive plan or any revision thereof in such parts as it deems appropriate.

This broad authority is conditioned to require consultation with water users, interested public bodies and public utilities. Also the Commission must, prior to adoption or revision of the plan or any part thereof, conduct public hearings, and consider and give due regard to the findings and recommendations of the signatory parties and interested groups.

B. Purpose

The comprehensive plan provides a basinwide strategy to serve the Commission and others in regard to the development, use, control, management, and conservation of the water resources of the basin whereby the goals set forth in the Compact, and such objectives and goals as may be determined by the Commission, may be effectively and efficiently achieved.

C. Scope

The comprehensive plan for the basin shall include: (1) existing public and private water resources related projects and facilities, and those which may be required, in the judgment of the Commission, to promote national economic development, enhance regional development, further the social well-being of the people of the basin, and improve and protect the quality of the basin environment; (2) necessary descriptive material, policies, objectives, guidelines and criteria, measures, programs, standards, studies and recommended actions necessary to attain the broad socio-economic objectives set forth herein.

D. Plan Development

Advances in technology, changing public priorities, shifting population trends, the ebb and flow of funding capabilities, and various natural events such as droughts or floods will alter the applicability of the plan or of specific aspects of the plan. Because of these conditions frequent reassessment of needs and demands, resetting of objectives, reanalysis of alternatives and revision of priorities will be carried out. Through this process the Commission will continue to identify demands not being met, or not assured of being met, by existing or planned programs and projects.

Other aspects of plan development will include: joint planning and program efforts with all levels of government and private interests; establishment of a feedback system to stimulate close coordination between the Commission and the public; coordination of programs and project implementation, with identification of the entities responsible for such action.

Another element of plan development will be the assembly and evaluation of pertinent reports, initiation of needed studies, development and refinement of models for water quality and quantity management and such other actions as may be necessary to maintain a current data base. Upon this base, continuing projections of population, economic and social trends, and environmental conditions will be made, and the demands and effects they may exert on the basin's water and related natural resources will be assessed and predicted, areas of need and possible conflict identified, alternatives considered and objectives and goals refined.

SECTION II - PROGRAM AREAS, OBJECTIVES AND GOALS

A. PLANNING OBJECTIVES The planning objectives of the Commission provide for multipurpose consideration and careful balancing of water resources program and project choices for implementation.

To give direction to its efforts and the efforts of others in planning for the conservation, management, development, and use of the water resources of the basin, the Commission has established the following planning objectives:

1. To provide for the optimum use or combination of uses of the basin's water and related natural resources to meet all foreseeable immediate and long-range demands in an efficient and timely manner.

2. To give careful consideration to the multiple planning objectives of National economic development, environmental quality, social well-being and regional development, with reasoned choices being made among them when they conflict.

3. To integrate the various facets of water resources planning and development programs with land use planning.

4. To encourage maximum local, State, and Federal agency and private sector input and feedback in planning, determination of needs and their resolution, including identification and consideration of alternative solutions.

5. To provide an equitable basis for review of proposed public and private development and use of the water resources of the basin.

B. PROGRAM AREAS, OBJECTIVES AND GOALS Within the framework of these planning objectives, several specific areas of water resources concern are identified: Flood Plain Management and Protection; Water Supply; Water Quality; Recreation, Fish and Wildlife; Watershed Management Protection; Cultural, Visual and Other Amenities.

Each area of concern is briefly discussed below as follows: problem identified; on-going programs noted; needs outlined; broad program objectives stated and specific goals set forth. Other areas of concern may be added from time to time as may be necessary.

1. Flood Plain Management and Protection

Floods are natural phenomena whose effects are amplified by man-made elements such as encroachment on the flood plain, improper land use, and inadequate conservation practices. Flood damages can be generally classified as agricultural, environmental, recreational, residential, commercial, industrial and public. The "public" classification includes all transportation facilities, such as roads, streets, bridges, rail lines, water and sewage treatment plants, power plants and all appurtenances, government owned buildings, other structures and parks.

Dramatic evidence of the vulnerability of public and private development on the flood plain to flood damage was shown when flooding occurred virtually basinwide as in 1936; or in individual subbasins as in 1946 when the Chemung River in New York State overran its banks exceeding previous high river stages; and in 1972 when a history-making flood affected most of the basin's streams and left an unprecedented trail of destruction behind.* (See Figure 2)

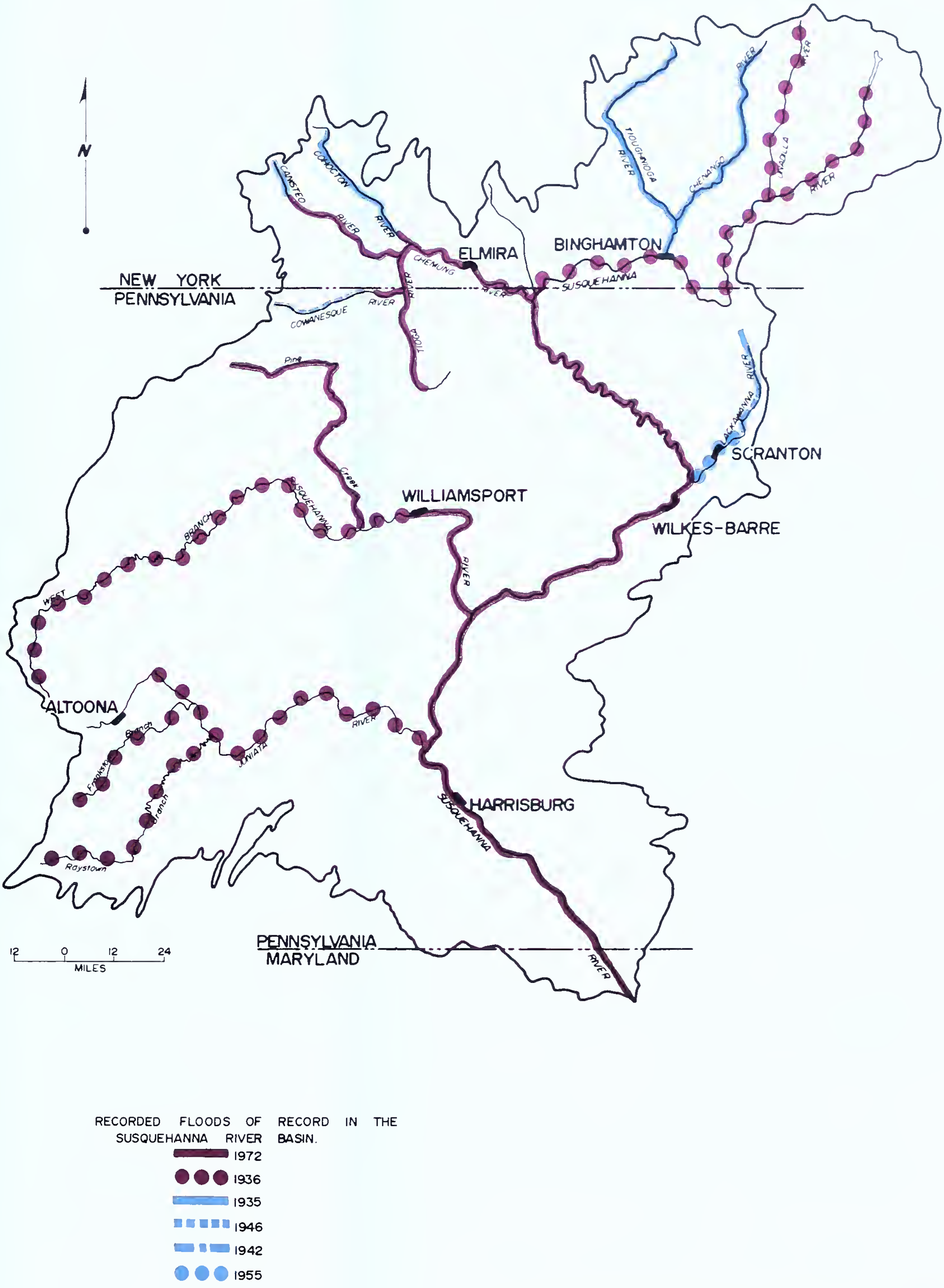
The Susquehanna River Basin Coordinating Committee Study delineated 1249 miles of the main stem of the Susquehanna River and its tributaries that require some form of flood plain management. (See Figure 3) Of the total miles, 1023 are recommended for flood plain management at the earliest opportunity and are listed in Appendix A. The basis for recommending the areas listed in the Appendix is past flood damages and potential for future flood damages.

Reduction of flood damages can be achieved through measures that are either structural or nonstructural or appropriate mixes of both. Structural measures encompass such items as dams, reservoirs, levees, walls and channel improvement, and provide local and often broad regional

*In the Susquehanna River Basin Coordinating Committee Report, dated June 1970, it was estimated flood damage in the basin would average $22 million a year. The direct damages from flooding in June 1972 have been estimated at $2.5 billion.

flood protection. Nonstructural measures include flood plain zoning, land management, flood proofing, relocation, and flood warning systems, and are generally oriented toward local flood protection. Several structural flood control projects have been developed within the Susquehanna River Basin. (See Figure 4) The Corps of Engineers has completed ten flood control dams, has one major structure, Raystown Dam, in final stage of completion, and two projects, Tioga-Hammond and Cowanesque Reservoirs, on which construction has just started. The Corps also has constructed local flood protection projects at thirty-five locations in the basin with six projects in preauthorization planning. The U.S. Soil Conservation Service has constructed thirty-three dams and six local flood protection projects in the basin. Five dams and thirty-six local flood protection measures have been constructed by the Commonwealth of Pennsylvania. In addition, Pennsylvania and Maryland cost-share up to fifty percent with local interests on the non-Federal funding of Federal flood control projects. New York provides most of the non-Federal funds and in some cases assumes responsibility for the operation and maintenance of Federal local flood protection projects. Despite these efforts by the Federal and State governments the potential in the basin for extensive flood damage remains high.

Of the nonstructural measures to reduce flood damage the most widely used measure in the basin to date has been



THE SUSQUEHANNA RIVER BASIN COMMISSION

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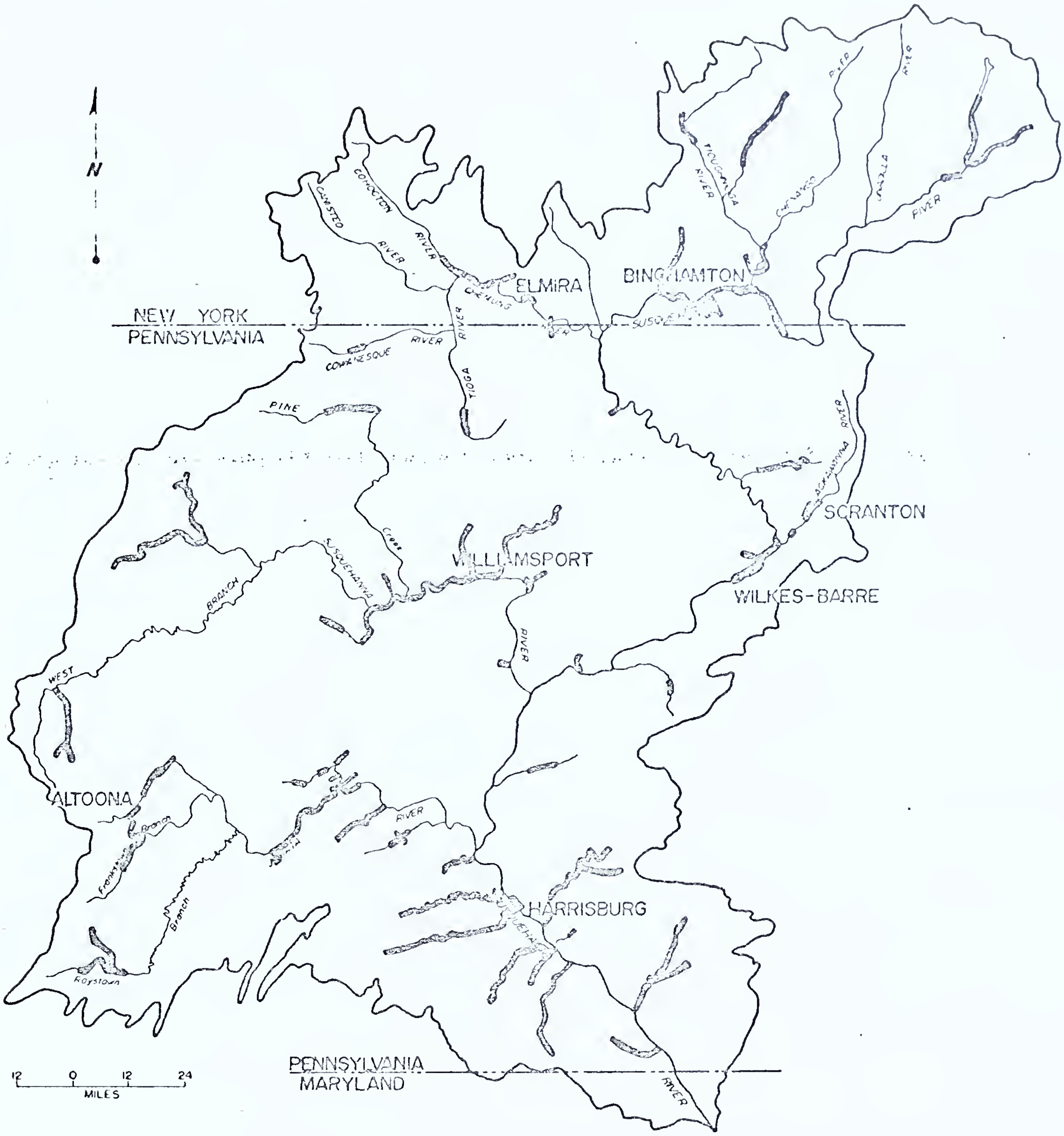
FLOODS OF RECORD FOR MAJOR STREAM REACHES

FIGURE NO. 2



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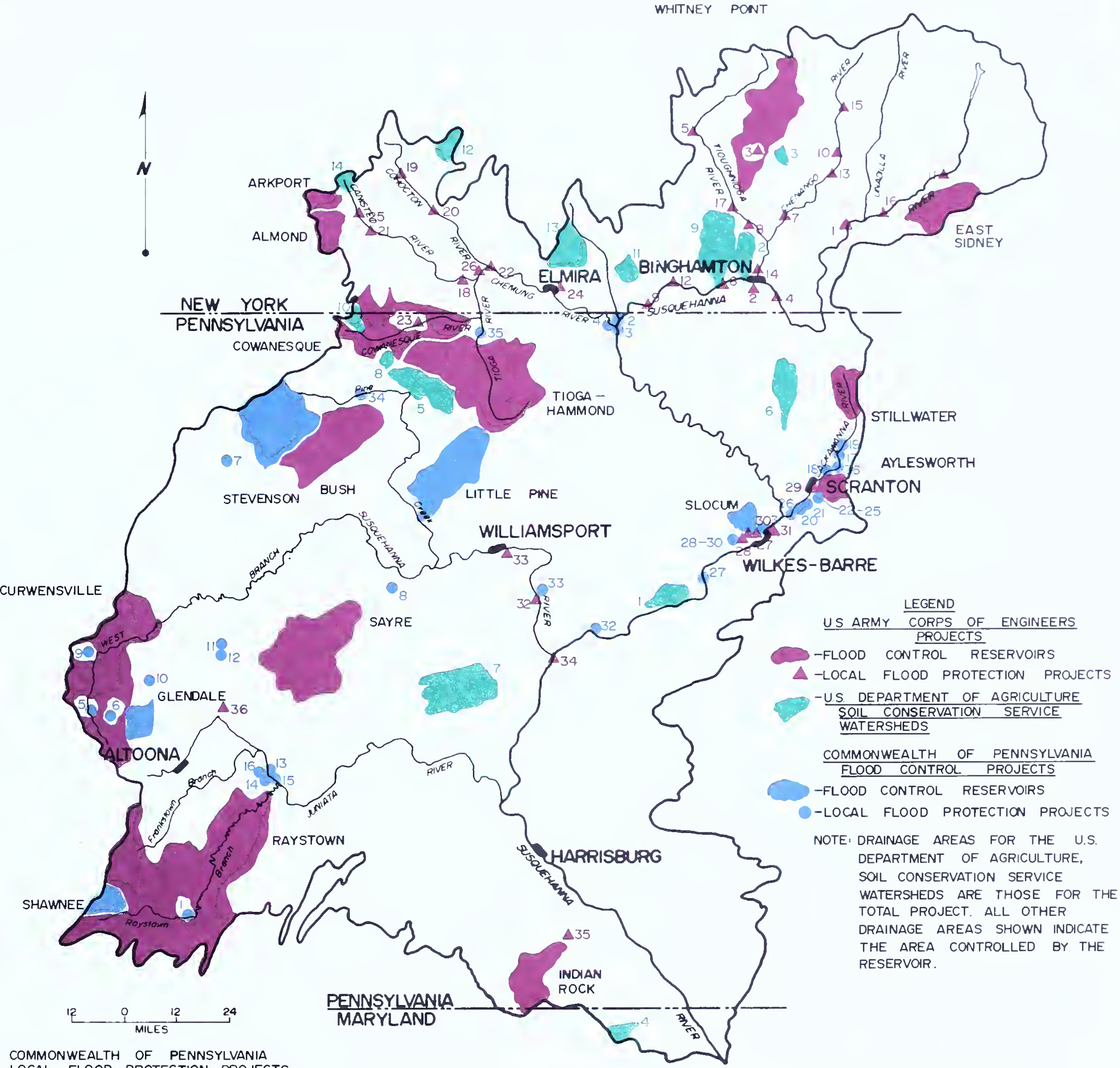
STREAM REACHES RECOMMENDED FOR FLOOD PLAIN MANAGEMENT BY THE SUSQUEHANNA RIVER BASIN COORDINATING COMMITTEE STUDY

FIGURE NO. 3



COMMONWEALTH OF PENNSYLVANIA LOCAL FLOOD PROTECTION PROJECTS

1. EVERETT
2. ATHENS
3. SAYRE
4. SAYRE
5. BARNESBORO
6. PATTON
7. EMPORIUM
8. MILESBURG
9. CHERRY TREE
10. IRVONA
11. PHILIPSBURG
12. PHILIPSBURG
13. HUNTINGDON
14. SMITHFIELD
15. HUNTINGDON
16. SMITHFIELD
17. MAYFIELD, OLYPHANT, BLAKELY, THROOP, AND DICKSON CITY
18. DICKSON CITY
19. MAYFIELD
20. MOOSIC
21. MOOSIC
22–25 SCRANTON
26. DURYEA
27. MOCANAQUA
28–30 PLYMOUTH
31. WYOMING
32. DANVILLE
33. MILTON
34. GALETON
35. TIOGA
36. BLAKELY

U.S. ARMY CORPS OF ENGINEERS LOCAL FLOOD PROTECTION PROJECTS

1. BAINBRIDGE, N.Y.
2. BINGHAMTON, N.Y.
3. CINCINNATUS, N.Y.
4. CONKLIN-KIRKWOOD, N.Y.
5. CORTLAND, N.Y.
6. ENDICOTT, JOHNSON CITY, VESTAL, N.Y.
7. GREENE, N.Y.
8. LISLE, N.Y.
9. NICHOLS, N.Y.
10. NORWICH, N.Y.
11. ONEONTA, N.Y.
12. OWEGO, N.Y.
13. OXFORD, N.Y.
14. PORT DICKINSON, N.Y.
15. SHERBURNE, N.Y.
16. UNADILLA, N.Y.
17. WHITNEY POINT VILLAGE, N.Y.
18. ADDISON, N.Y.
19. AVOCA, N.Y.
20. BATH, N.Y.
21. CANISTEO, N.Y.
22. CORNING, N.Y.
23. ELKLAND, PA.
24. ELMIRA, N.Y.
25. HORNELL, N.Y.
26. PAINTED POST, N.Y.
27. KINGSTON-EDWARDSVILLE, PA.
28. PLYMOUTH, PA.
29. SCRANTON, PA.
30. SWOYERSVILLE – FORTY FORT, PA.
31. WILKES-BARRE, HANOVER TWP., PA.
32. MILTON, PA.
33. WILLIAMSPORT, PA.
34. SUNBURY, PA.
35. YORK, PA.
36. TYRONE, PA.

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION WATERSHEDS

1. BRIAR CREEK, PA.
2. LITTLE CHOCONUT, FINCH HOLLOW, TROUT BROOK, N.Y.
3. GENEGANTSLET CREEK, N.Y.
4. LITTLE DEER, MD.
5. MARSH CREEK, PA.
6. MARTINS CREEK, PA.
7. MIDDLE CREEK, PA.
8. MILL CREEK, PA.
9. NANTICOKE CREEK, N.Y.
10. NORTH FORK COWANESQUE RIVER, PA.-N.Y.
11. PATTERSON, BRIXIUS, GREY CREEK, N.Y.
12. UPPER FIVE MILE CREEK, N.Y.
13. NEWTOWN – HOFFMAN CREEK, N.Y.
14. MARSH DITCH, N.Y.

THE SUSQUEHANNA RIVER BASIN COMMISSION

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EXISTING AND UNDERWAY FLOOD CONTROL PROJECTS

FIGURE NO. 4

the flood warning system, provided through a cooperative effort by the Federal and State governments.

This program is accompanied by temporary evacuation of people and readily movable goods, which helps prevent loss of life and reduces property damage.

Establishment of other nonstructural measures, such as flood plain zoning, relocation and setting of encroachment lines beyond which structures may not protrude, are a function of local government. Prior to the June 1972 flood there had been little application of these measures.

The U. S. Army Corps of Engineers in cooperation with other Federal, State and local agencies, and under contract with the Federal Insurance Agency of the Department of Housing and Urban Development conducts flood plain information studies upon request by communities. USGS, SCS, State and local agencies also develop detailed reports of flood history, frequency, stages and other pertinent flood information.

Another measure designed to reduce the burden of property loss for flood victims is the flood insurance program of the U.S. Department of Housing and Urban Development. A key feature of this program is the requirement that for residents to be insured, their community must enact and enforce flood plain use ordinances. Prior to the June 1972 flood little effort had been directed by local government toward an increased level of flood plain land use control.

In the past the flood risk factor has been ignored in terms of regulation of flood plains. The Commission intends to encourage and enforce by all means within its power the institution and implementation of action at all levels of government to see that this factor is not ignored in the future.

Since the June 1972 flood, applications for Federal flood insurance have greatly increased in number. Communities in the basin that have enacted satisfactory flood plain use ordinances, however, are very few in number. Opposition to the development of flood protection structures due to their impact on the environment has increased considerably in the last few years. To prevent the impasse that is developing in this important area - reluctance of local government to control flood plain use and opposition to flood detention structures - there is need for a clear presentation to the public of specific flood hazard problems, the alternative solutions such as flood control, flood plain evacuation, i.e., removal of homes and businesses vulnerable to flood damage, and other measures, and the impact of given solutions.

Program Objective To prevent loss of life and significantly reduce future damages from floods within the basin through an integrated system of structural flood control and nonstructural flood plain management measures.

Goals

a. A basinwide flood plain use plan to guide flood plain development and redevelopment so as to prevent loss of life and reduce future flood damage.

b. Effective control over flood plain use and development in all areas susceptible to flooding.

c. Increased flexibility in Federal policies to enable allocation of Federal funds for flood plain management, land acquisition, and other nonstructural measures.

d. A basinwide program of flood damage reduction structures that includes consideration of multipurpose water storage and is integrated with nonstructural flood plain management measures.

e. Establishment of an improved and expanded flood forecasting and warning system to provide the maximum amount of time during which evacuation and other damage reduction measures may be taken.

2. Water Supply

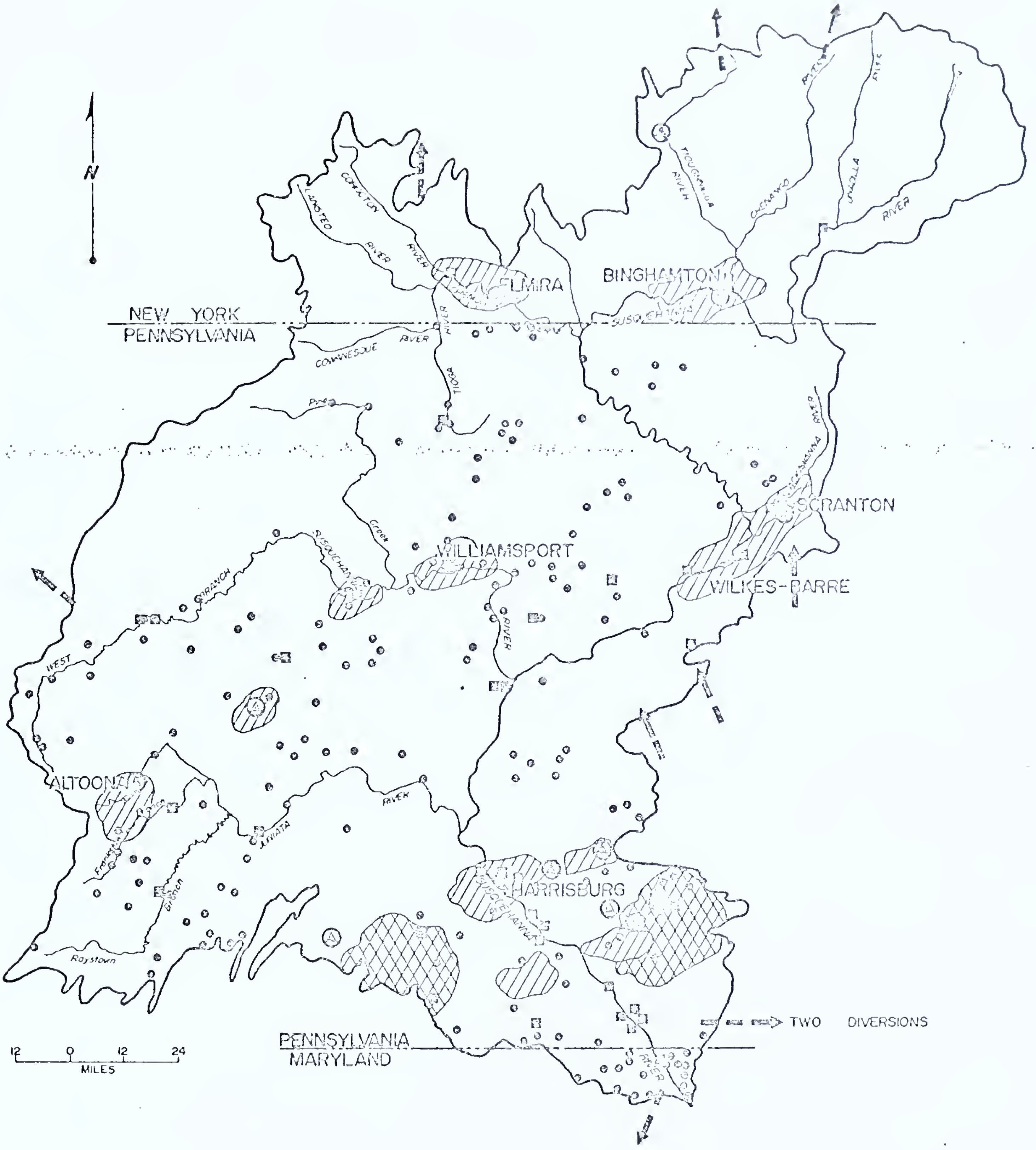
The water resources of the basin are abundant and renewable, due to an average annual precipitation of 39 inches. Regardless of this natural abundance of water, it does not necessarily follow that water is or will be available in quantity and quality, or be appropriately distributed in time and place commensurate with existing and future demands without proper planning and development. (See Figure 5)

Current and future water supply problems in the basin may be broadly categorized as stemming from: (1) inadequate surface water storage and distribution systems; (2) limited development of ground water sources; (3) pollution of surface and ground waters; (4) excessive consumptive uses without compensation; (5) out-of-basin diversions; (6) financial and institutional constraints.

The supply of water available for municipal, industrial, and agricultural complexes located along and close by the main Susquehanna River and its major tributaries appears ample to meet the demands of these users in the 10-15 year future. Beyond this period any substantial increase in use may, without additional sources of water, result in deficiencies for other purposes, including maintenance of water quality.

Communities, industries, and agricultural interests depending on supplies of water from smaller tributaries frequently experience periods of shortage or threatened shortage, and with increased demand current problems will become more severe and occur with greater frequency.

Some urban communities where deficiencies in domestic-municipal water supplies may occur were identified in the



LEGEND

POTENTIAL WATER SUPPLY PROBLEM AREAS

Ⓐ -URBAN COMMUNITIES

● -RURAL COMMUNITIES

⇦ -INTERBASIN DIVERSIONS

▣ -ELECTRIC GENERATING FACILITIES

▨ -HIGH DOMESTIC AND INDUSTRIAL WATER DEMAND AREAS

▦ -HIGH IRRIGATIONAL DEMAND AREAS

THE SUSQUEHANNA RIVER BASIN COMMISSION

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POTENTIAL WATER SUPPLY PROBLEM
AND HIGH DEMAND AREAS

FIGURE NO. 5

Susquehanna River Basin Coordinating Committee Report and are as follows: Cortland, Binghamton, and Elmira in New York; Scranton, Hazleton, State College, Altoona, Shippensburg, Lebanon, Hershey, Manheim, Ephrata and Lititz in Pennsylvania. Over 160 rural communities experiencing varied water supply problems were also identified.

Seven out-of-basin diversions totaling over 300 MGD were authorized by action of the signatory States prior to enactment of the Compact. Requests to increase some of these diversions are expected, and new diversion proposals to supply water-short areas in the lower Delaware River Basin, the Elk River Basin, and areas to the west of the Susquehanna River in Maryland are anticipated.

Consumptive losses of water from the basin will increase when two major electric generating facilities now under construction come on line. They are expected to discharge 48 MGD, or more, to the atmosphere through their cooling process. Additional electric generating facilities, and other industrial developments in the basin requiring large quantities of water for cooling, could cause further depletion of in-stream flows unless cooling systems that reduce consumptive losses of water are devised or compensating flows from storage are provided.

Agricultural water uses for domestic, livestock, irrigation and fruit tree spraying purposes are increasing.

Because most of these uses are consumptive, and are derived from surface streams, available in-stream flows for other downstream uses will be reduced.

The prolonged drought during the 1961-1966 period illustrated the inadequacy of many individual and municipal sources of supply and the limitations of storage and distribution systems. As a drought is a recurrent event, a repeat of the 1961-66 experience under increased water demand conditions can be expected.

The aggregate of anticipated increased and new demands on available supplies of water can be expected to exert an effect on the existing ecological balance of affected streams. If historic flows are altered there may be significant but yet to be determined effects on all users, including the receiving waters of the Chesapeake Bay.

Historically, provisions for water supply have been left to the individual, the community, or the industry needing the water. This patchwork approach to provision of water supply is no longer sufficient in some areas to equitably deal with existing and future competition for sources of supply, especially during low stream flow periods.

The existing and future water supply problems of the basin have received considerable study by Federal, State and local governments. Four major Federal studies, three completed and one in process, consider water resources from varied viewpoints. These studies have been conducted under the direction of the U.S. Army Corps of Engineers.* They are:

a. Development of water resources in Appalachia, completed in 1969. The study covers most of the Susquehanna Basin, with major exceptions being basin headwaters counties in New York, several counties south and east of the Susquehanna River below Harrisburg, Pennsylvania, and the Maryland part of the basin.

b. The Susquehanna River Basin Coordinating Committee Study, completed in 1970, specifically covers the entire Susquehanna River Basin.

c. North Atlantic Regional Water Resources Study, completed in 1972, covers most of the northeastern United States, extending from Maine to Virginia, and including all of the Susquehanna River Basin.

d. The Northeastern United States Water Supply Study includes the same area as Item c, as it relates to the Susquehanna River Basin.

The three completed studies identify problem areas, provide general and specific short and long-range recommendations, and contain detailed information on resources, economic activity, and population.

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*The studies listed under Items b and c are part of the Federal Water Resources Council's Comprehensive Planning Program. The Corps was designated to chair these study programs.

Pennsylvania plans to prepare a State Water Plan and is well advanced with pertinent data collected, work programs and planning methodologies established and several planning studies underway in individual river subbasins. Water resources data are also being compiled in New York and Maryland, and basin water and related land resources plans are being formulated in New York.

Local studies have been completed for many of the more than 400 public water supply utilities in the basin, most of which project sharply increasing supply demands.

In brief review, it has been established: that local water supply problems exist; that future water supply problems are not too far away; that water shortage emergencies can and do occur; and that many studies have been undertaken and recommendations regarding water supply problems presented.

It now remains that the many on-going programs be coordinated; that the demands projected in the several studies, and by the water supply utilities, industry and agricultural interests be compiled and assessed; that the numerous recommendations presented in the various formal reports and elsewhere be brought together for comparison and evaluation; that a uniform and more comprehensive system for allocating the basin's waters be developed; and that basinwide water management programs that provide for all categories of short and long-range water uses be formulated and implemented.

Program Objective Fulfillment of immediate and projected long-range demands of the people of the basin for domestic, municipal, agricultural and industrial water supply, including use for cooling and irrigation.

Goals

a. Coordination of water supply, water quality, and land use planning development programs.

b. Development of basinwide and regional plans for the conservation, development, management, and use of the surface and ground waters of the basin for domestic, municipal, industrial and agricultural use.

c. Establishment of an equitable system for the allocation of water for various uses, including protection of the receiving waters of the Chesapeake Bay.

d. Development of contingency management plans for immediate implementation during water-short periods.

e. Improved utilization of water through system improvements and more efficient management of water resources, including metering and pricing, recycling and other practices.

f. Integration of water supply systems on a regional or intermunicipal basis where feasible.

3. Water Quality

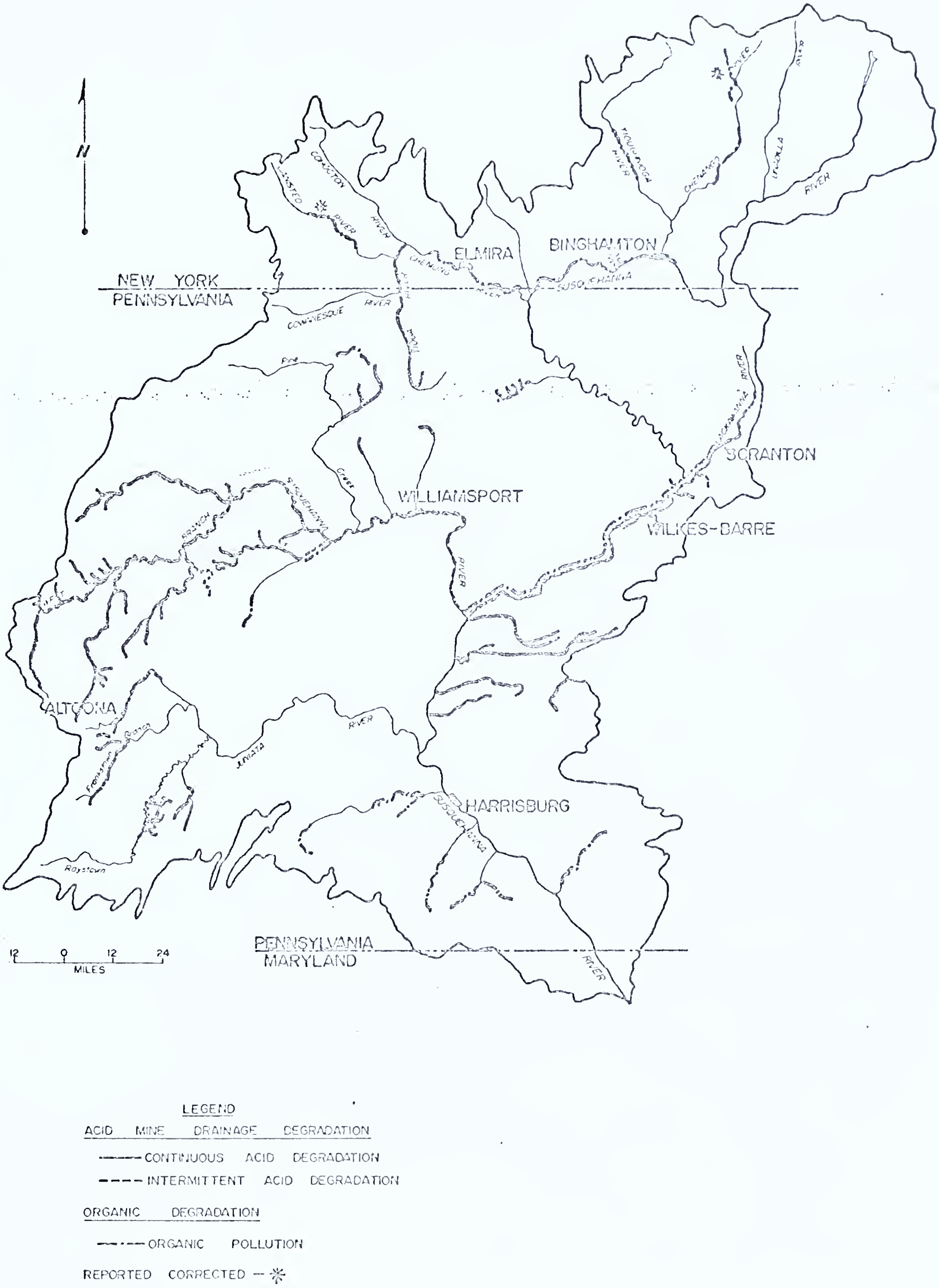
The majority of surface and ground water resources in the basin exhibit good natural water quality. Most of the over 2,600 miles of rivers and principal tributaries have high levels of dissolved oxygen as well as varied and extensive biological activity. There are, however, over 850 miles of surface water sources that are severely degraded, and many others that are affected to some degree by pollution. (See Figure 6)

New York

The primary cause of stream degradation in the New York part of the basin is discharge of inadequately treated municipal and industrial waste. Degradation of the Susquehanna River occurs in the Tioughnioga River below Cortland; in the Chenango River below Norwich; the Cowanesque River downstream from Westfield; the Chemung River downstream from Elmira and Corning. Mine drainage originating in Pennsylvania in small tributary streams causes a major pollution problem in over 36 miles of the Tioga River, one of the main streams that forms the Chemung River.

Pennsylvania

The major causes of stream pollution in Pennsylvania are acid mine drainage and inadequately treated municipal wastes. The water quality in the Susquehanna River above the



THE SUSQUEHANNA RIVER BASIN COMMISSION
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MAJOR AREAS OF STREAM DEGRADATION

FIGURE NO. 6

Lackawanna River confluence generally is excellent. Below the Lackawanna River downstream to Sunbury, there is a significant deterioration of water quality. Many streams entering the river in this area are badly degraded by mine drainage and poorly treated or untreated organic wastes.

Tributaries arising in the mining areas, mainly in the Lackawanna and Wyoming Valleys, are responsible for about one-half of the total acid produced in the main Susquehanna River.

The West Branch of the Susquehanna River originates in the bituminous coal fields of central Pennsylvania. The predominate water quality problem in the upper part of the West Branch from the headwaters downstream to Lock Haven is caused by mine drainage pollution. The acid produced in the broad headwaters of this area seriously impairs the beneficial use of the West Branch and many of its major tributaries.

Downstream from Lock Haven, the West Branch is intermittently affected, usually during summer and fall months, by "slugs" of mine drainage pollution flushed from old workings during periods of heavy rainfall. Current municipal and industrial waste discharges throughout this subbasin generally cause only localized pollution problems immediately downstream from the discharge points.

Water quality of the Juniata River and its basin is generally good. In all but two major tributaries (the Little Juniata River and the Frankstown Branch) stream flows are adequate to assimilate the treated waste effluents that are discharged and maintain water quality suitable for most beneficial uses. Mine drainage pollution is not considered a serious problem due to the small number of streams affected in the Juniata Basin.

Although the quality of the Susquehanna River from Sunbury to Harrisburg is acceptable for most uses, several of the tributary streams are degraded by mine drainage, organic and agricultural pollution. These are Mahanoy Creek, Wiconisco Creek and Shamokin Creek, and several tributaries of the Conodoguinet Creek.

From Harrisburg downstream to the mouth of the Susquehanna River a small amount of acid mine drainage enters through the Swatara Creek, and heavy loads of sediment and nutrients are received from the Codorus, Conewago, Conestoga, and Pequea Creeks. Thermal pollution from electric power generating stations poses some threat to water quality in this lower reach of the river, as large quantities of heated water are discharged to the Susquehanna River from several electric generating stations.

Maryland

The few tributaries of the Susquehanna River in Maryland are relatively small and not significantly affected by pollution. The Susquehanna River in the Maryland part of the basin does exhibit moderately high levels of dissolved solids.

In general, the ground waters of the basin are good and suitable for most uses without much treatment. In some areas, ground water shows rather high hardness due to underlying limestone rock formations, and a few areas are plagued by sulfur, iron and manganese conditions. Sediment pollution is a modest problem throughout the basin.

In recent years efforts by local, State and Federal agencies have been directed toward increased water pollution control efforts, and the construction of facilities to treat municipal and industrial wastes has been greatly accelerated. The signatory States have established water quality standards for interstate streams of the basin. These standards have received Federal approval. They are reasonably compatible, in that where differences occur the most stringent requirements are generally on the upstream waters. Standards for intrastate waters also have been established by the signatory States. These interstate and intrastate standards are currently being reviewed at the request of the Federal government to provide water of acceptable quality for most purposes, including contact water sports in keeping with Federal Water Quality Act Amendments of 1972.

There is a need for research to determine better solutions to the acid mine drainage problem, non-point source pollution problems, and to enable more economic handling of sewage, including a higher level of nutrient removal. A regional approach to waste water management should be emphasized where it is found feasible from environmental, engineering and economic points of view. There is also a need for new and expanded avenues of funding and cost-sharing in the implementation of waste water treatment projects and facilities.

The Compact provides that the States shall have the primary responsibility for water quality management and control. The plan reflects this requirement and is designed to direct Commission action toward coordination of local, State and Federal water quality management efforts; uniform enforcement; compliance with established standards; and to generally encourage amendment and modification of standards for any waters of the basin in relation to their reasonable and necessary use, as the Commission may deem in the public interest.

Program Objective Eliminate and control water pollution sufficiently to maintain and establish water quality capable of supporting multiple purpose uses for: public water supply after treatment; recreation, fish and wildlife; agriculture, industrial and other such uses.

Goals

a. Compliance with the water quality standards and criteria for intrastate and interstate waters of the basin as established by the signatory parties.

b. Increased assistance in abatement of acid mine drainage pollution through elimination or correction of the conditions contributing to formation of acid water in abandoned mines.

c. A coordinated basinwide water quality and biological data collection and monitoring system.

d. Regionalization of waste water treatment and collection systems to the extent it is economically and technically feasible, and environmentally responsible.

e. Increased control of storm water runoff and non-point source pollution.

4. Recreation and Fish and Wildlife

The basin has a wealth of natural recreational areas and vast potential for increased recreational development and use. The rural character of the basin and its numerous rivers and streams, forested areas, and general scenic beauty provide for high quality recreational experiences.

The demand placed on basin resources by basin residents and others for recreational activities is expected to increase as more leisure time becomes available and economic improvement occurs. The spreading megalopolises on the basin's border areas will exert new pressure on the rural and scenic areas of the basin for development of recreational facilities.

Conditions that unfavorably influence the recreational potential of the area are mainly related to past activities. Extractive industries have left unsightly scars on the land where coal and clay deposits have been removed. Transportation development followed natural pathways along stream banks and in many areas either blocked off access to streams for miles or blighted scenic benefits, or both. Many communities developed along immediate stream banks have contributed to overall environmental degradation. Some industrial plants likewise have located along waterfront areas with notable lack of respect for appearance or condition of the stream bank or the immediate stream bed. Power generating facilities built on the main river did not include fish passage devices to provide for the migration of fish resulting in the loss of extensive runs of sport and food fish.

Pollution of streams - by sediment, by drainage from abandoned mines, and by discharge of industrial and domestic waste - has to a considerable extent reduced the recreational and fish and wildlife potential of the basin. Additionally, individual and small groups of vacation dwellings and cabins presently border miles of streams and break up remote tracts, since little or no plan of development or control has been effectuated to date.

While the basin contains a maze of streams ranging from rushing mountain brooks to mile-wide reaches of river, it lacks in natural lakes and ponds.

To fulfill the demands of existing and future recreation, and fish and wildlife programs in the basin, Federal, State and local governmental and private agencies have acted in many ways to utilize and enhance the natural recreational attributes of the basin.

Over 1.5 million acres of land in the basin have been purchased by Federal and State agencies. Most of this acreage is in State forest and game lands, although considerable sections of these lands have been developed as parks and other recreation areas. (See Figure 7)

Seven Corps of Engineers' projects include recreational facilities which are now under State or local management. There are seventy-eight State parks - twenty-one in New York, fifty-four in Pennsylvania and three in Maryland - that provide for a wide range of day and/or overnight outdoor recreation uses. Twenty-three public fishing lakes have been developed in addition to those in State parks, as have been ninety-four public fishing and boating access areas, thirty-one in New York and sixty-three in Pennsylvania. Additionally there are numerous private facilities, hunting and fishing clubs and resort developments in the basin.

These considerable efforts are being furthered through the development of master plans for recreation and fish and wildlife by the signatory States, and through Federal programs that provide financial support for recreation and fish and wildlife land acquisition, research and facilities development.

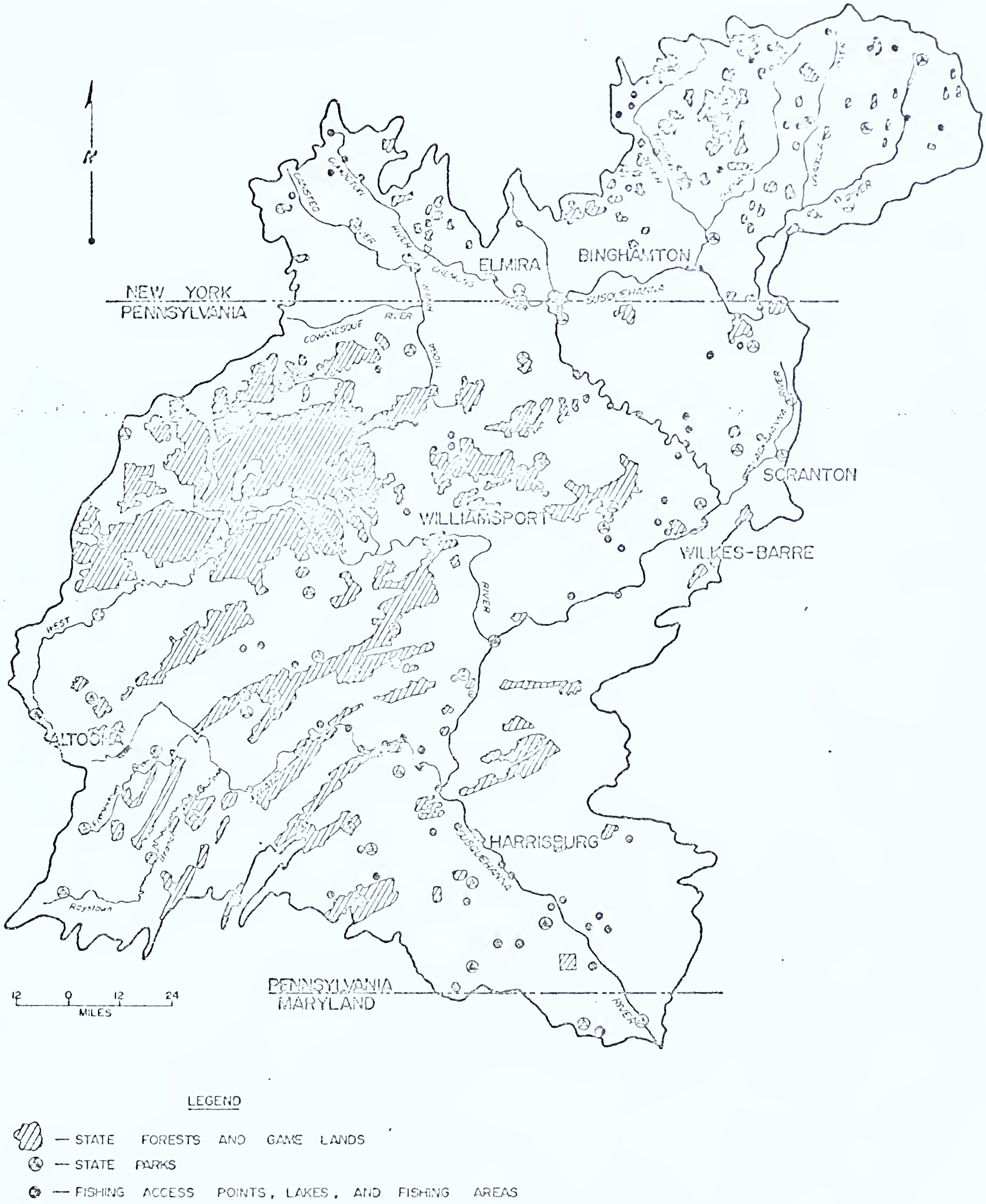
An obvious need is the coordination of the various areas of planning to assure all economic, social and environmental concerns and proposals are carefully evaluated. Consideration must be given to conflicting land and water uses, and alternative solutions identified and investigated in sufficient detail to enable making final development decisions that reflect the best combination of alternatives.

Program Objective Preserve and/or enhance existing outdoor recreation and fish and wildlife potentials to insure an acceptable variety of outdoor recreation opportunity, and where possible, expand these opportunities at water resources development works.

Goals

a. Optimum utilization of existing water resources for purposes including recreation, and fish and wildlife pursuits.

b. Inclusion of appropriate public recreation and fish and wildlife programs at existing and proposed new water resources projects to the extent compatible with primary project purpose.



THE SUSQUEHANNA RIVER BASIN COMMISSION

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EXISTING MAJOR PUBLIC RECREATIONAL FACILITIES

FIGURE NO. 7

c. Delineation of certain water and adjoining land areas, including wetlands, to be retained in a natural state, or wherein development and use are closely controlled.

d. General improvement of fish and wildlife habitat related to the water resources of the basin.

e. Increased public access to streams, reservoirs, lakes and ponds as appropriate.

5. Watershed Protection and Management

Water and land use jointly are affected by what transpires within each of these two separate entities. The quantity and quality of water sources affect the land development patterns. The degree of development and the specific land management practices are strong factors which affect the quantity and quality of an area's water resources.

Watersheds of urban character frequently exert adverse effects on water resources that extend well beyond boundaries of the local area. These intensely developed areas produce faster rates of surface runoff, limit the recharge of ground water supplies, produce concentrations of polluting materials, and incur heavy withdrawals of water which may be in excess of local supply capability. These conditions are well demonstrated at most of the urban areas in the basin.

Rural watersheds also exert adverse effects on water resources if forest and agricultural practices are not carefully designed to control surface runoff and soil erosion.

As much of the basin is rural with extensive forested areas, sedimentation is modest with exceptions occurring mainly in the Chemung River subbasin and tributaries of the Susquehanna River below Harrisburg. Additionally, coal and clay mining activities in the Pennsylvania coal fields where land reclamation has not been undertaken contribute sediment. Refuse from coal mining and coal processing operations continue to contribute to the sediment problem.

Several Federal, State and local agencies, and others supported by funds from various levels of government, direct attention to the many aspects of watershed management. The Federal Soil Conservation Service has an active basinwide program to assist local people in providing flood water detention and land treatment on a small watershed basis. The States are cost-sharing partners on many of these projects along with local governments. The States also maintain forestry programs and provide management assistance as to county-level agencies. Urban watersheds are managed by the government of the particular political subdivision involved.

While there is an interdependence and a continuing level of interaction between adjoining rural and urban areas, planning and management usually stop at the specific political boundary separating local jurisdiction. There is a need to bridge this boundary through coordination of all levels of water and land use planning, and the development of basinwide and regional plans.

Program Objective Proper stewardship of urban and rural land resources and development and use thereof, where such development and use is critical to water resources conservation, management, development, utilization and protection.

Goals

a. To protect and enhance the water resources potential of the basin through consonance of urban and rural land uses and water resources interests.

b. Development of priorities for uses of land areas particularly critical to water resources interests.

c. Coordination of planning regarding future urban and rural land development, as it relates to water supply and waste water management needs.

d. Use of land in keeping with its conservation and natural resource capabilities.

6. Cultural, Visual and Other Amenities

The basin has a wealth of historic and archeological sites, as well as scenic and natural amenities that have inherent values worthy of protection. The names Susquehanna, Chemung, Chenango, Tioughnioga, Lackawanna, Chillisquaque, Kishacoquillas, Tangascootack and Octoraro, and Amish-Mennonite settlements are but a few of the obvious indicators of the basin's history and culture. Scenic and natural amenities are exemplified by Pennsylvania's Grand Canyon, the Pine Creek Gorge, Hyner View and Horseshoe Bend.

The wilderness character of a stream reach is often destroyed through thoughtless encroachments that could well have been located elsewhere or planned to minimize intrusion. The urban environment should not be overlooked when considering protection of the historic, scenic and natural amenities of an area. Densely populated and developed areas often encompass historic sites which merit preservation. Scenic overlooks within developed areas have potential to blend urban and rural vistas.

Until recently, land and water resource development practices normally did not afford such sites much consideration. This change in priority of values has resulted from a growing public awareness and expression of desire to protect scenic and historic sites.

Federal, State, local and private agencies and groups have identified many historic, cultural, scenic, archeological and other amenities. There is a need to expand and compile the existing information to provide the necessary data for current and future considerations regarding water resource development projects in a timely fashion. Another need of equal importance is to clarify the role and value to be assigned these amenities in decisions regarding water resources development.

Program Objectives Designation, preservation and enhancement of open space, wild and scenic stream reaches, scenic vistas, historic sites and other natural amenities in rural and urban areas of the basin, as appropriate.

Goals

a. Designation and classification of historic, wild and scenic areas and other natural amenities within the basin.

b. Establishment of policies and programs to preserve and/or enhance unique, historic and scenic areas.

c. Determine the role, benefits, and values of historic sites, scenic vistas, wild and scenic stream reaches and other natural amenities, relative to competing uses.

SECTION III - GUIDELINES AND CRITERIA

A. The objectives and goals set forth in the comprehensive plan provide a broad guide for public and private planning and conservation, development and use of the water resources of the basin. The general guidelines and criteria listed below further outline a sound basis for rational, well-considered decisions among alternatives or competing uses of basin water resources, and form major considerations upon which the Commission will evaluate proposals of Federal, State, local and private sectors.

1. Projects shall provide for beneficial water resources management and development.

2. Projects shall be consistent with published Commission policies and the objectives and goals included in the comprehensive plan.

3. The need for a project must be clearly substantiated by supporting data, alternatives identified and the basis for project choice described, and willingness indicated by all interested parties to meet funding requirements.

4. Proposed projects and programs shall consider mixes of nonstructural and structural measures depending on the circumstances.

5. If a proposed measure is one part of a series

of measures designed to accomplish a particular need, assurance shall be provided that the other necessary measures have been considered.

6. Flood plain management measures such as zoning ordinances, building codes and other regulations which provide for no development or for permissible uses in flood hazard areas must be compatible with appropriate Federal and non-Federal guidelines and criteria.

7. The floodway shall not be restricted by further development which will adversely effect the flow of water. Consideration must be given to the means, over the long-term, for relocating or phasing out developments in the floodway which adversely effect the flow of water.

8. When feasible, provisions should be included for flood proofing commercial, public and residential buildings and other structures that must be located below the level of the 100-year flood line, but are not located in the floodway.

9. Structural measures should not be considered for urban or other developed areas unless their design, singularly or in combination with other measures, provides for a desired minimum protection against the flow of the 100-year flood or, if necessary, a flood of greater magnitude modified for anticipated watershed conditions.

10. The seven day average low flow, for the period

of record for the stream, subbasin, and withdrawal point, shall be utilized for determining the availability of all surface water supplies. The location of aquifers, their safe yield, and their effect on surface water flow shall be used to determine the availability of ground water supplies.

11. Provisions shall be made for a minimum stream flow for normal stream maintenance, protection of the natural biological community of the stream and other purposes.

12. Development and use of water resources shall be planned and managed to assure that such actions do not adversely affect historic quantity and quality of flow and thereby disrupt seasonal salinity, circulation patterns and biological productivity of the Upper Chesapeake Bay.

13. Compensation shall be required for consumptive uses during periods of low flow.

14. Low flows to the Chesapeake Bay shall not be reduced. Low flow to the Chesapeake Bay is defined as the one-in-twenty year low flow in the months of August, September and October. (The flows of 3,500 cfs, 3050 cfs and 2,820 cfs into Conowingo Reservoir during August, September and October respectively are selected surrogates for low flow into the Bay at the mouth of the Susquehanna River during those months.)

15. The least costly means compatible with

environmental quality and resource conservation objectives and goals shall be given the highest consideration for water supply purposes.

16. Domestic water supply purposes shall have priority for surface and ground water resources.

17. Appropriate State and Federal standards and criteria for water pollution control shall be followed.

18. Proposals for projects which have potential to adversely affect water quality or quantity and public safety shall include contingency plans for both normal operating conditions and for emergencies.

19. Project proposals must recognize the high public value of wild or scenic river reaches, scenic or historic areas, other natural amenities and recreational use of waters.

20. Dredging or alterations of stream banks and channels which may adversely affect the quantity or quality of surface or ground waters, fish and wildlife habitat or other environmental or cultural values shall be carefully planned and controlled to minimize their adverse effect or avoided whenever possible.

21. Projects for large scale use of ground water should consider the need for recharge to reduce possible adverse effects on ground water levels or base flows.

22. Any project proposal shall consider the potential impact on upstream and downstream areas.

23. Any project proposal submitted to the Commission for review and possible inclusion in the Comprehensive Plan shall fulfill National Environmental Policy Act requirements.

SECTION IV - EARLY ACTION PROGRAM

This Early Action Program is the link between the Commission's Annual Water Resources Program and its overall objectives and goals. It serves to assure successive continuity of the annual program by providing a future perspective in which the timeliness of individual programs and their contribution to the comprehensive plan can be judged.

The Early Action Program provides a 5-year perspective that will be updated on an annual basis utilizing existing studies, recommendations and data which, in the judgment of the Commission, are valid for initiating new measures as the program evolves.

The Commission does not intend that it should assume the responsibility for implementing all of the recommendations in the program. Many Federal, State and local agencies have the authority and responsibility to pursue some of these programs. The Early Action Program does, however, establish the Commission's priorities for meeting needs and demands identified under its Program Objectives.

As discussed under the Objectives and Goals Section of the Commission's plan, the Early Action Program will cover Water Resources Development including Flood Plain Management and Protection, Water Supply, Water Quality, Recreation and Fish and Wildlife, and other water related land uses.

The Early Action Program is in part new proposals, and in part expansion of existing programs, to be carried out insofar as possible by local, State and Federal agencies. In developing this program extensive usage has been made of recommendations contained in the Susquehanna River Basin Coordinating Committee Study which was completed in June 1970. The Coordinating Committee Study Report was the culmination of seven years of intensive new studies and review of previous studies. In the report, water resources problems in order of basinwide priority were rated as follows: water quality, recreation, water supply, and flood control. Flood control was rated a lesser priority than other water resources development needs because a considerable amount of flood control works already existed. The experience of Hurricane Agnes in June 1972, however, revealed that flood control and reduction of flood hazard are still seriously needed in many parts of the basin. Because of this, flood hazard reduction is emphasized in the Commission's program as having the highest priority for action programs. Except for flood hazard reduction, the following recommendations are not necessarily listed in order of priority.

1. Flood Plain Management and Protection

Of the 3.5 million people who reside in this basin, about 1 million are exposed to serious damage by occurrence of the standard project flood, which is a flood resulting from the most severe combination of meteorologic and hydrologic conditions considered reasonably characteristic of the basin. This number includes about 500,000 people who are now protected by levee systems from the 100-year flood. Because many of the communities are exposed to catastrophic flooding, it is imperative that a sound basin-wide program of flood plain management and flood control be developed. Flood plain management should be emphasized to prevent further unwise use of flood hazard areas, and to the extent feasible, relocation of high damage structures must be accomplished. Where relocation and other management measures cannot be taken or would not significantly reduce future flood damages, structural measures to control or reduce peak flood flows are needed.

The Commission's Early Action Program provides recommendations to initiate programs to meet these needs and demands. (See Figures 8 and 9, pages 79 and 81)

Nonstructural Recommendations

Recommendation 1: Preparation of maps that delineate the flood hazard area for communities within the basin in sufficient detail that flood insurance risk may be accurately determined.* These maps to be prepared as follows:

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*See Appendix B for a listing of those areas being mapped under this program.

a. Obtain existing mapping of flood plain communities from sources such as Pennsylvania or New York State and evaluate its compatibility for use in flood hazard delineations.

b. Where existing mapping does not cover the area required or is not usable, develop new topographic mapping of the communities.

c. Using the mapping obtained through Item a or b, perform the necessary hydrologic and hydraulic computations to determine the flood hazard areas within the communities.

Purpose: These maps will provide a basis for flood plain management plans, community redevelopment, determination of flood insurance risk, and planning of protection measures.

Responsibility: Susquehanna River Basin Commission with funding provided by the Federal Flood Insurance Administration, Appalachian Regional Commission, signatory States and others, as appropriate.

Recommendation 2: Prepare a general plan of existing and proposed flood plain uses, based on flood hazard, as a guide for future management and development of these areas.* The plan will provide the basis for:

*See Appendix A for those areas within the Basin for which sound flood plain management programs are recommended.

a. Flood plain zoning ordinances, building codes, and subdivision regulations.

b. Establishment of waterfront encroachment lines and flood channel limits.

c. Determination of costs and benefits of relocation and other flood plain management measures.

d. Planning modification of existing structures and land uses to reduce future flood damages.

Purpose: To lessen economic damages in future flood situations.

Responsibility: Local and State governments with assistance from Susquehanna River Basin Commission.

Recommendation 3: Improve and expand basinwide flood forecasting services. Set priorities for new flood forecasting locations, stream and rain gages and data transmission stations. To provide adequate coverage of communities throughout the basin, it is estimated that the program will have to be expanded to include flood forecasting and warning services for 35-40 additional locations on smaller tributaries with several new flood forecast locations on major tributaries of the basin.

Purpose: To provide the maximum feasible warning time at all locations subject to significant flood hazard.

Responsibility: Federal-State Flood Forecasting Service, with assistance from USGS, signatory States, Susquehanna River Basin Commission and others.

Recommendation 4: Coordinate, encourage and develop basinwide education and training programs regarding importance of flood warning reports, and train personnel to assist National Weather Service personnel in emergency situations. During the Agnes flood, disaster forecasting and warning operations were hampered due to the lack of trained volunteer technical and clerical personnel to assist National Weather Service personnel.

Purpose: To prepare local citizens or public employes to provide volunteer technical and clerical assistance to National Weather Service personnel, as needed, during emergencies.

Responsibility: National Weather Service, State and local Civil Defense agencies, Extension Services, with assistance from Susquehanna River Basin Commission.

Recommendation 5: Encourage participation in the Federal Flood Insurance Program.

Purpose: Reduce the impact of flood damage losses to potential flood victims and encourage local governments to comply with nationally accepted flood plain management measures.

Responsibility: Federal Flood Insurance Administration and other Federal agencies under executive order, signatory State and local agencies, with assistance from Susquehanna River Basin Commission.

Recommendation 6: Coordinate and encourage basinwide land management programs.

Purpose: Reduce the rate of surface water runoff and soil erosion and encourage the use of land in keeping with its natural capabilities.

Responsibility: Soil Conversation Service, signatory States, and Susquehanna River Basin Commission.

Structural Recommendations

Recommendation 1: Develop a basinwide plan to reduce future flood damages, and to satisfy other multipurpose water and related land resources purposes based, in part, on the authorized Corps of Engineers' flood damage prevention review study of the Eastern Susquehanna Basin.

Determination of the feasibility of providing additional protection for well developed communities within high flood hazard areas shall receive first priority in this proposed program. The approach to providing such protection, if found feasible, and the degree of protection shall be recommended.

In developing the plan all alternatives and combinations thereof will be evaluated in terms of effectiveness and economic, social and environmental impact, and the overall reasonableness of being accomplished. Alternatives to be considered shall include, but not be limited to:

a. Single and multipurpose flood control reservoirs to reduce and delay flood peaks.

b. Local flood protection works - levees, flood walls and channel improvements.

c. Flood plain, use, control and management, including relocation, zoning, and flood proofing measures.

Existing Federal, State, and other studies and all appropriate on-going programs are to be utilized as a basis for this project.

Purpose: To enable comparison of all measures, so that the best overall combination of feasible alternatives can be identified and acted upon.

Responsibility: Corps of Engineers, Soil Conservation Service, signatory States and Susquehanna River Basin Commission.

Recommendation 2: The authorized Federal flood control projects listed below should be funded and/or completed as soon as possible. These include two major dams, five small watershed flood control projects and two local flood protection projects. These projects in conjunction with existing structures will provide control of 13 percent of the drainage area of the Susquehanna River. (See Appendix C) The recommended projects are:

Tioga-Hammond Reservoir - (Corps of Engineers)

The Tioga-Hammond Project consists of two dams; one across the Tioga River and the other across Crooked Creek just upstream of their confluence at Tioga, Pennsylvania. The two reservoirs will be joined by a connecting channel and will share a common spillway and outlet works. This project will control 400 square miles of drainage area and will provide major flood protection benefits at Tioga and Lawrenceville, Pennsylvania, and at Corning and Elmira, New York. Its flood control effects will extend as far downstream as Sunbury, Pennsylvania. The project will also provide considerable recreation benefits. Construction is underway with completion expected by 1977.

Cowanesque Reservoir - (Corps of Engineers)

The Cowanesque Dam will be located on the Cowanesque River about three miles upstream from Lawrenceville, Pennsylvania. This project will control 297 square miles of drainage area for flood control, and will provide a permanent recreation pool. This dam will provide major flood control benefits at Lawrenceville, Pennsylvania, and Corning and Elmira, New York. Significant flood reduction effects will be realized as far downstream as Wilkes-Barre, Pennsylvania.

Estimated date of completion 1980.

Newtown Creek-Hoffman Creek Watershed - (SCS)

This proposed P.L 566 watershed project includes six flood control and one multiple purpose flood control recreation structures. It is located in Schuyler and Chemung Counties, New York and would provide flood protection benefits for Elmira. The project also includes channel improvements on Newtown, Hoffman and Diven Creeks.

Marsh Ditch Watershed - (SCS)

This watershed project is located near Burns above Hornell in Allegany and Steuben Counties, New York and it is primarily for flood control. It is under construction and includes channel improvement and other water control structures.

Nanticoke Creek Watershed - (SCS)

There are five flood control structures and one fish and wildlife structure remaining to be built in this watershed under P.L. 566. The project includes a dike, levee and channel stabilization project to be constructed along Nanticoke Creek. Flood protection would be provided for West Corners, New York and the Nanticoke Creek flood plain.

Briar Creek - (SCS)

Site Pa-498, which remains to be built, is a single purpose flood control reservoir located on Glen Brook immediately above the Glen Brook Reservoir in Columbia County, Pennsylvania. It is part of the P.L. 566 Briar Creek Watershed Work Plan and will control 2.61 square miles of drainage area to provide flood protection benefits at Berwick, Pennsylvania.

Middle Creek Watershed - (SCS)

There are two reservoirs remaining to be built in this watershed under P.L. 566: One will be a multipurpose flood control recreation reservoir located on Middle Creek; and the other will be a multipurpose flood control water supply reservoir located on Kerns Run, a tributary of Middle Creek. The structures are in Snyder County, Pennsylvania, and will offer major flood protection benefits at Middleburg.

Wyoming Valley Local Flood Protection Project - (Corps of Engineers Project)

The Wyoming Valley levees at Kingston, Forty-Fort, Wilkes-Barre, Hanover Township, Plymouth and Edwardsville were damaged in the June 1972 flood. Repair work is underway with plans being to restore the levees to their original design height, plus approximately two additional feet at selected sections to accommodate possible subsidence. Estimated completion date is late 1973.

Tyrone Local Flood Protection Project - (Federal & Local)

The Tyrone Local Flood Protection Project consists of major channel improvements on the Little Juniata River, South Bald Eagle Creek and Shell Run, Tyrone, Pennsylvania. It also includes a structure to divert Sink Run flood waters into Shell Run. The project is being funded Federally and locally, with local costs being shared by the Borough of Tyrone and the State of Pennsylvania. Construction is underway and it is estimated the project will be completed by 1978.

Recommendation 3: Studies of several proposed projects should be completed as soon as is possible. Appendix D lists those now recommended. This Appendix will be subject to continued revision as studies are completed and as potential projects are proposed.

The projects listed will include those recommended by Federal, State, and local agencies and found to have potential in fulfilling the goals and objectives of the Commission.

The recommended studies will enable determination of project feasibility. Feasible projects will be subject to Commission review and public hearing, and, if approved, will be recommended for authorization and funding. Appendix C reflects the additional drainage areas controlled by these projects.

2. *Water Supply*

A priority concern of the Commission regarding water supply is the development of a general strategy to deal with water shortage emergencies. The coordination of on-going water supply planning and development efforts, assessment of projected water demands and evaluation of the proposed measures to meet these demands follows in priority.

Recommendation 1: Development of a plan for the management of water shortage emergencies affecting municipal water supplies. The plan will provide a basis for:

a. Delineating an area of actual or imminent water shortage.

b. Altering prior allocations, diversions or release requirements.

c. Imposing direct controls on the use of water.

d. Coordinating the efforts of Federal, State, and local agencies and other entities and persons affected.

Purpose: To protect public health and safety, and to generally minimize adverse effects of water shortage emergencies.

Responsibility: Susquehanna River Basin Commission and appropriate signatory parties.

Recommendation 2: Evaluation of on-going water supply planning programs and completed studies. This program will include the following:

a. Determination of on-going Federal and State programs relative to statewide or regional water supply planning and development.

b. Compilation and assessment of projected domestic, municipal, industrial, and agricultural water demands, including projected diversions.

c. Evaluation and analysis on a local, basin and regional basis of the measures recommended in completed Federal, State and local water supply studies.

Purpose: Minimize duplication, identify alternatives and establish basis for coordinated basinwide water supply plan.

Responsibility: Susquehanna River Basin Commission and appropriate agencies of signatory parties.

Recommendation 3: Encourage and support research on technology and methodology of developing water supply sources and water conservation.

Purpose: To make more efficient use of water resources.

Responsibility: Shared among Federal, State and private interests with Susquehanna River Basin Commission providing coordination of efforts, to the extent practical, within the basin.

3. Water Quality

Commission efforts regarding water quality concerns in the basin will be generally directed to coordination of the efforts of Federal, State and local pollution control and management efforts; evaluation of the effectiveness of adopted water quality standards and criteria; and direction of attention to special problems.

Recommendation 1: Coordinate on-going and planned water quality control and management programs of an interstate nature, and evaluate their effectiveness.

Purpose: To achieve uniformity of water quality standards and levels of compliance among the signatory States, and provide a single system of evaluating the effectiveness of adopted standards.

Responsibility: Susquehanna River Basin Commission in cooperation with appropriate agencies of the signatory parties.

Recommendation 2: Develop a plan for the eventual abatement or reduction of acid mine drainage from abandoned mines. The initial steps in such a program will be:

a. Provide criteria and methodology for determination of most advantageous abatement schemes.

b. Develop abatement program priorities.

c. Encourage establishment of continuing Federal assistance programs for the financing of projects to abate acid discharge from abandoned mines.

Purpose: To obtain maximum benefits in terms of acid pollution abatement from dollars invested, and to focus continuing Federal and State attention on this regional problem.

Responsibility: Susquehanna River Basin Commission in close cooperation with appropriate agencies of the signatory parties.

Recommendation 3: Implementation or completion of regional waste water management studies for urban and urbanizing areas within the basin.

Purpose: To provide a basis for regional or subbasin management of waste water.

Responsibility: The States and localities in cooperation with the Susquehanna River Basin Commission, Environmental Protection Agency and other Federal agencies such as the Corps of Engineers in keeping with Federal and State planning guidelines.

4. Recreation, Fish and Wildlife

The basin's resources provide broad opportunities for varied forms of outdoor recreation, and support extensive populations of fish and wildlife. This natural capability is both enhanced and reduced by human development of these resources. The Commission's Early Action Program, and its careful consideration of the impact of proposals for the use, development and management of water resources, is planned to minimize and prevent adverse effects on recreation, and fish and wildlife potentials.

Recommendation 1: Identify streams, lakes and wetlands in terms of their optimum recreation, fish and wildlife potentials.

Purpose: To provide a ready source of information for use in planning, evaluating project impact, identifying high value areas, and preparing protection, enhancement or utilization recommendations.

Responsibility: Cooperative effort among the signatory parties and the Susquehanna River Basin Commission.

5. Watershed Protection and Management

The Commission's basinwide goals for flood plain management, flood control, water supply and water quality, when met, will result in partial achievement of the goals set forth for watershed management and protection, as these concerns are all closely interrelated.

Recommendation 1: Develop a program to coordinate, at all levels of government, urban and rural water resources planning.

Purpose: Minimize conflicts in water and land use programs to enable more effective and efficient use of water resources.

Responsibility: Susquehanna River Basin Commission.

6. Cultural, Visual and Other Amenities

There are limitless amenities of a cultural or visual nature in the basin. To assure preservation and protection of historic and unique cultural, visual and other amenities, there is a need for public and governmental awareness of these attributes.

Recommendation 1: Determine the role, value, benefits and relative worth of open space, historic sites, scenic vistas, wild and scenic stream reaches, and other natural amenities in terms of competing uses, and the planning objectives of the Commission.

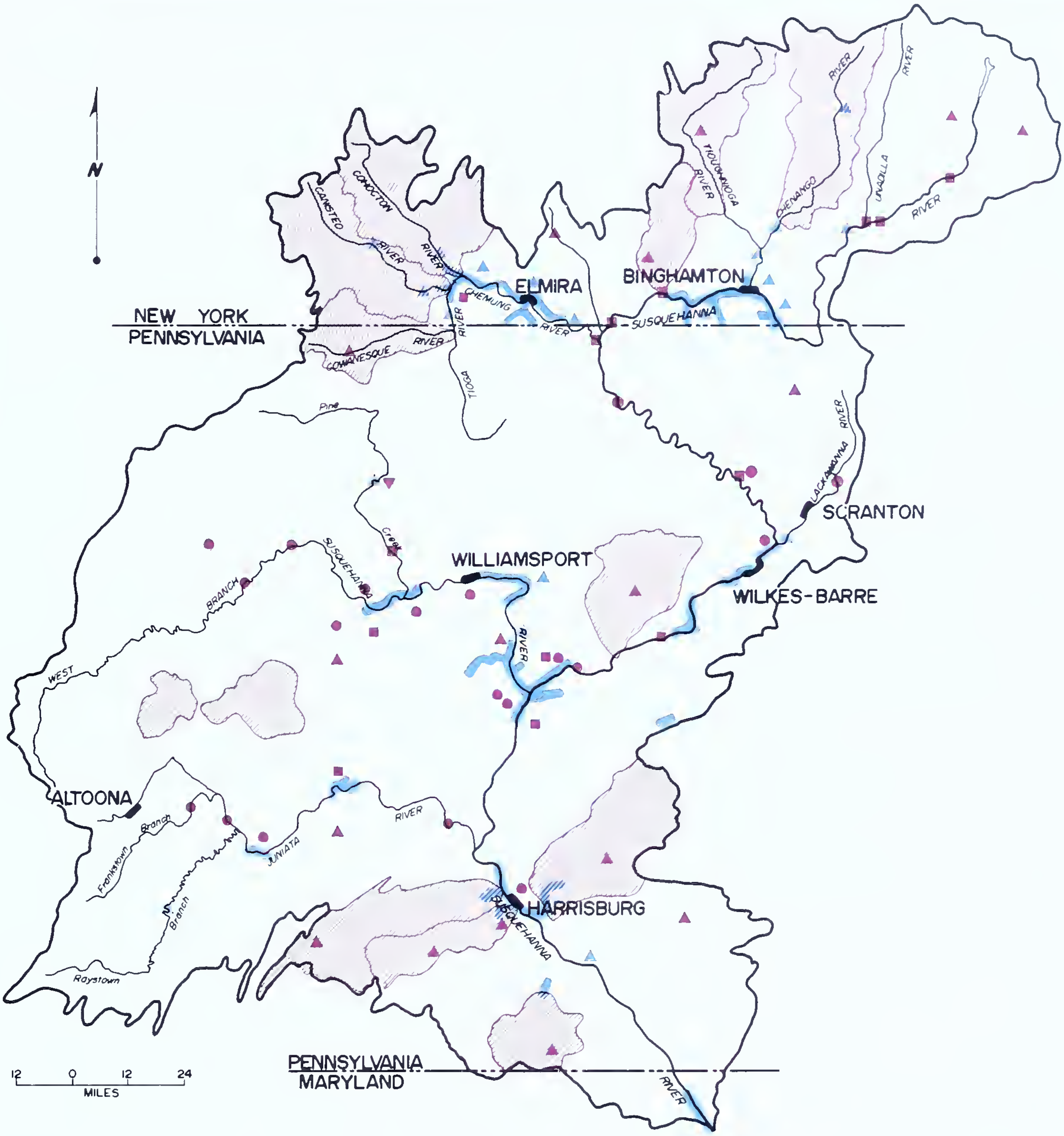
a. Determine who benefits.

b. Consider ways that benefits can be translated into tangible values.

Evaluate the impact that preservation of cultural and visual resources will have on the value of affected areas.

Purpose: To enable establishment of a basis on which value judgments may be made for weighing relative worth of competing demands for resources use in the basin.

Responsibility: Shared among Federal, State and private interests with Susquehanna River Basin Commission providing coordination of efforts, to the extent practical, within the basin.



- ● PROPOSED FORCAST POINTS
- ■ BACKUP STAFF GAGES
- ▲ AUTOMATIC RAIN GAGES
- ▨ SMALL SELF-HELP WATERSHEDS
- ▲ EXISTING STATIONS FOR WHICH FLOOD FORCAST ARE ISSUED.
- 〰 INITIAL PROGRAM OF STREAM REACHES RECEIVING FLOOD PLAIN MAPPING BY THE SUSQUEHANNA RIVER BASIN COMMISSION

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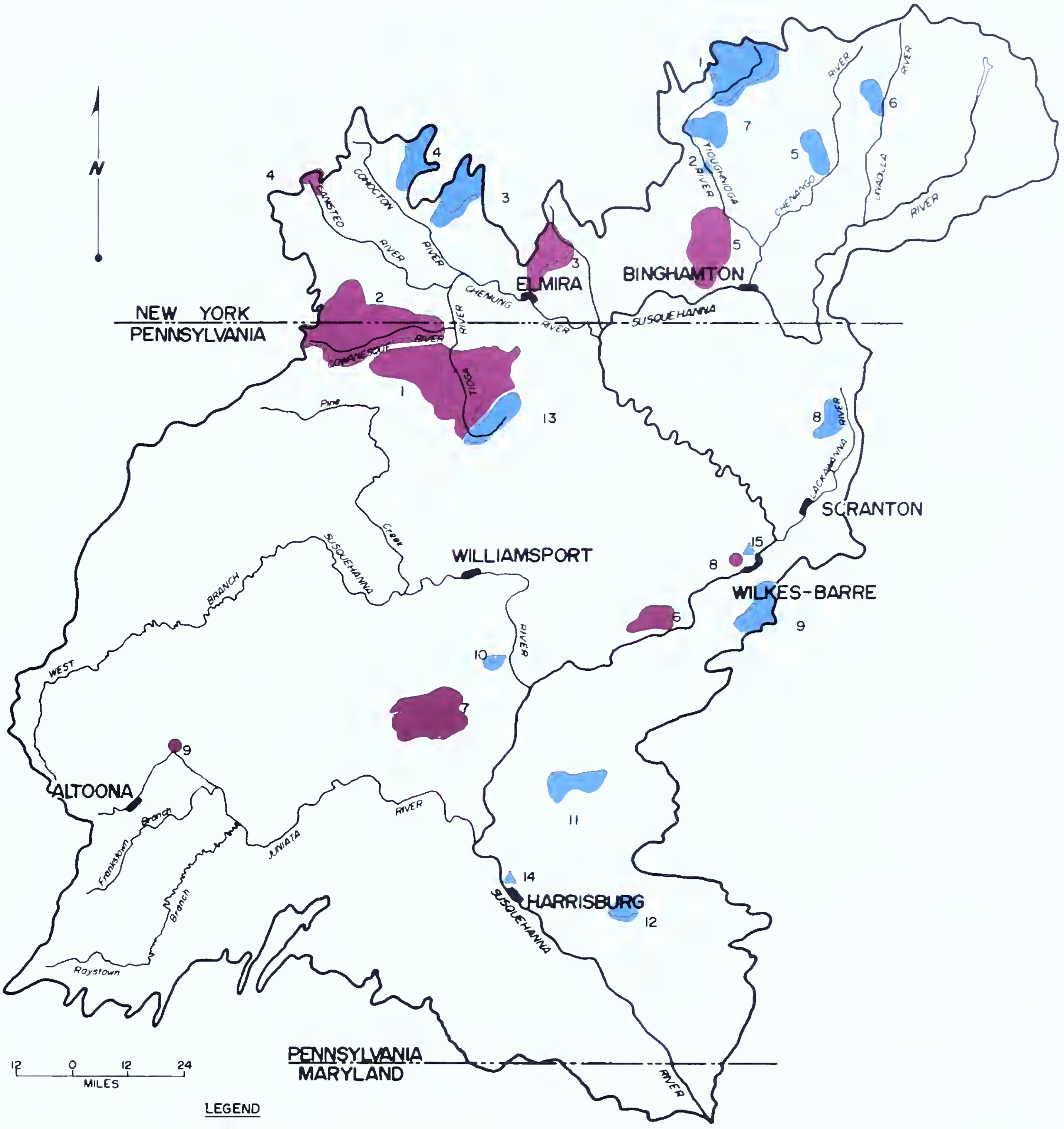
EARLY ACTION PROGRAM
NONSTRUCTURAL MEASURES

FIGURE NO. 8



LEGEND

AUTHORIZED PROJECTS TO BE FUNDED AND / OR COMPLETED

▨ —DAMS AND WATERSHEDS

● —LOCAL FLOOD PROTECTION PROJECT

1. TIOGA – HAMMOND DAM
2. COWANESQUE DAM
3. NEWTOWN – HOFFMAN CREEK WATERSHED, N.Y.
4. MARSH DITCH WATERSHED, N.Y.
5. NANTICOKE CREEK WATERSHED, N.Y.
6. BRIAR CREEK WATERSHED, PA.
7. MIDDLE CREEK WATERSHED, PA.
8. WYOMING VALLEY L.F.P., PA.
9. TYRONE L.F.P., PA.

IMPLEMENTATION STUDIES

▨ —DAMS AND WATERSHEDS

▲ —LOCAL FLOOD PROTECTION PROJECTS

1. TRUXTON DAM
2. MARATHON L.F.P.
3. MUD CREEK DAM
4. FIVE MILE CREEK DAM
5. CLARK CREEK WATERSHED
6. MILL BROOK WATERSHED
7. TROUT BROOK WATERSHED
8. DUNDAFF CREEK WATERSHED
9. NESCOPECK CREEK WATERSHED
10. BULL RUN WATERSHED
11. WICONISCO CREEK WATERSHED
12. CHICKIES CREEK WATERSHED
13. UPPER TIOGA WATERSHED
14. HARRISBURG L.F.P.
15. WYOMING VALLEY L.F.P.

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EARLY ACTION PROGRAM – STRUCTURAL MEASURES

FIGURE NO. 9

PART III

GENERAL INFORMATION

SECTION I - BASIN PHYSICAL FEATURES*

A. The Susquehanna River Basin includes three major physiographic provinces: the Appalachian Plateau, the Valley and Ridge, and the Piedmont. Very small parts of the Blue Ridge and Atlantic Coastal Plain also intrude into the basin. Differences in topography and geology form a basis for these natural subdivisions, although the whole area has a similar geologic history and related geological features. These differences form a basis, too, for the settlement patterns of the basin. (See Figure 10)

1. Appalachian Plateau Provinces

Fifty-six percent of the Susquehanna drainage area occupies the Appalachian Plateau Province in New York and Pennsylvania. This region is the remnant of an extended plain that has been carved into a succession of high hills and deep valleys by the Susquehanna and its tributaries. The plateau stretches from the Catskill Mountains in New York to northern Alabama. Its eastern boundary is usually recognizable by the steep escarpment known as the Allegheny Front. On the west, the plateau merges gradually into the central lowlands. The Appalachian Plateau has two regions with marked topographic differences. The northern portion was modified by Wisconsin glaciation 18,000 years ago, relatively recent in geologic time. Here the valleys are U-shaped and gentle. As a rule, the hills rise from 500 to 800 feet above the valleys, with comparatively steep but beautifully symmetrical slopes. In the unglaciated portion of the plateau, the more rugged mountains have peaks that rise from 500 to 1,800 feet above the steep, generally V-shaped valleys. In both portions, settlement has taken place mostly in the valleys, and transportation routes wind their way along the valley bottoms.

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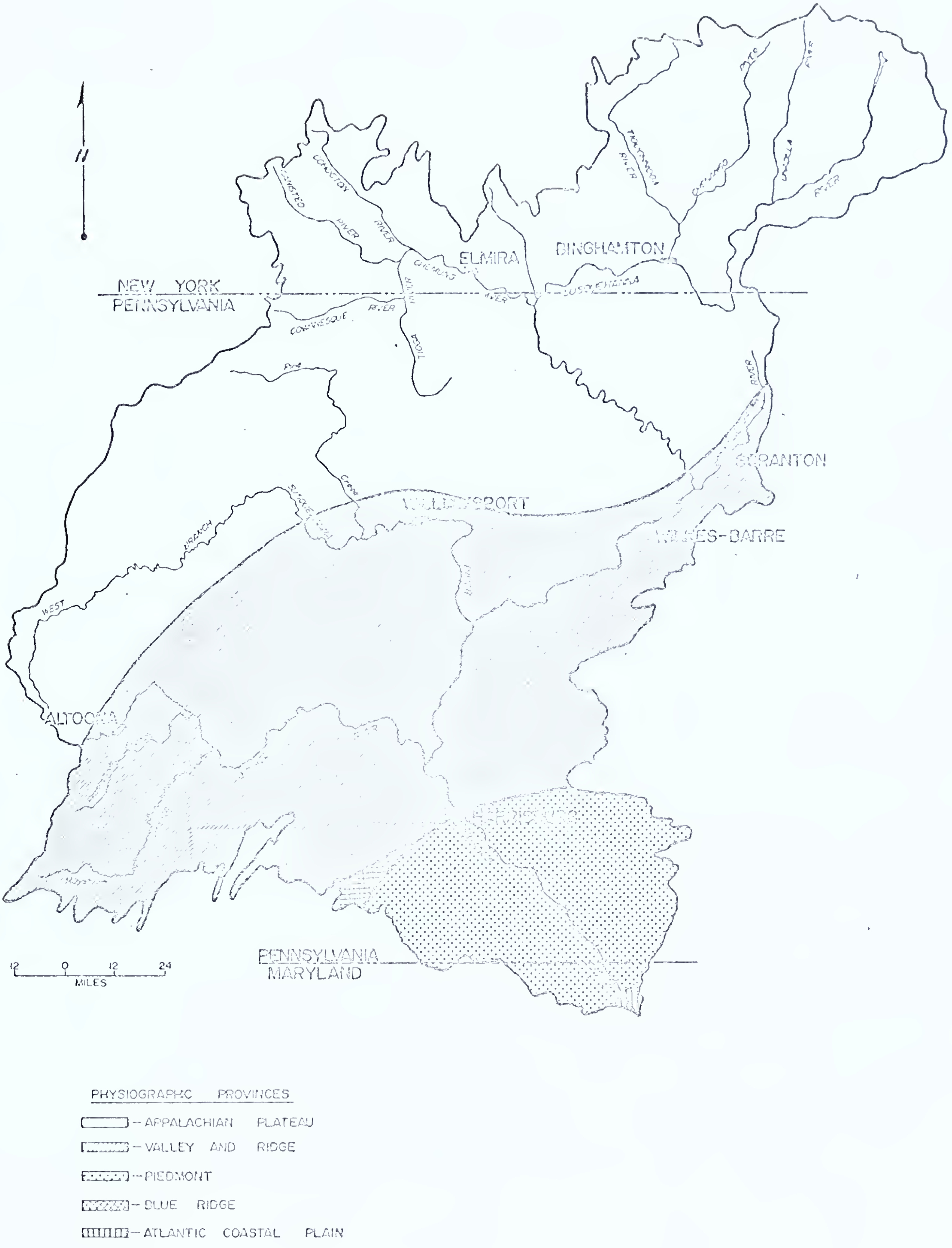
*This section taken from Susquehanna River Basin Coordinating Committee Study, with modifications to update information.

2. Valley and Ridge Province

The Valley and Ridge Province, like the Appalachian Plateau, extends from New York to Alabama. It is a mountainous region that covers approximately thirty-seven percent of the basin, including the Great Valley in the south that comprises about six percent of the basin. This province contains rocks that were bent by great force into the folds which created the ridges and valleys that run roughly parallel in a northeast-southwest direction, sweeping off at the north in broad curves to the east. The ridges, which rise from 500 to 1,600 feet above the surrounding valleys, are broken in places by wind and water gaps. The northern part of the Valley and Ridge Province has been glaciated and shows some modified relief. In the eastern part, the folding of the rocks created the distinctive anthracite coal fields of the Lackawanna-Wyoming Valley. As in the Appalachian Plateau, transportation routes



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PHYSIOGRAPHIC PROVINCES

FIGURE NO. 10

and settlement have followed the valleys and the gaps in the ridges.

3. Piedmont and Blue Ridge Provinces

The Piedmont and Blue Ridge Provinces also extend through the whole eastern part of the country, with the Blue Ridge extending into southern Pennsylvania. They have been described as the "Older Appalachians" in contrast to the "Newer Appalachians", a term applied to the Appalachian Plateau and Valley and Ridge Provinces. The Piedmont occupies about seven percent of the area of the basin. Relief ranges from 400 to 600 feet, with the Blue Ridge Province having a somewhat greater relief. The valleys of Lancaster and York Counties have comparatively low relief, allowing a denser and more even population distribution than in the more mountainous parts of the basin.

4. Atlantic Coastal Plain Province

The Atlantic Coastal Plain is less than one percent of the total basin area and has a topography of low relief. Over two million years ago, when sea level was 250 to 300 feet lower than today, Chesapeake Bay and its tributaries formed part of the Susquehanna Basin in this province.

5. The Rivers in the Basin

The Susquehanna River is about four hundred and fifty miles long. It rises in New York where a small stream leaves Lake Otsego at Cooperstown. The river flows southward into Pennsylvania around the "Great Bend" and back into New York, then westward through Binghamton to be joined by the Chemung River at Athens, Pennsylvania, just a few miles south of the New York State line. From this point, the river meanders southeastward across the Appalachian Plateau and through the steep Allegheny Front until it is met by the Lackawanna River at West Pittston, where it turns southwestward to its confluence with the West Branch Susquehanna River at Sunbury.

The Chemung River is formed by the confluence of the Cohocton and Tioga Rivers west of Corning. The headquarters of these two tributaries are in the glaciated plateau country of the northwestern portion of the basin.

The West Branch rises in the Appalachian Plateau in the western part of the basin and flows north then east through the Allegheny Front at Lock Haven, extending generally eastward through Williamsport, where it turns south and cuts through several ridges to its junction with the Susquehanna at Sunbury. The Juniata River, another major tributary, joins the Susquehanna at Duncannon, thirty-eight miles downstream from Sunbury. The Juniata is formed by the confluence of the Frankstown Branch and Little Juniata River, which rise in the Appalachian Plateau.

Below its junction with the Juniata, the Susquehanna River enters the Piedmont Province, turns southeast and becomes an impressive stream nearly a mile wide. Just below

Harrisburg, it flows through a series of gorges now dammed by hydro-electric power facilities. From the Maryland border, the river continues southeastward for fourteen miles, passing one more major dam, until it mingles its waters with the tidal Chesapeake Bay.

6. The Climate of the Basin

The Susquehanna River Basin has a continental type of climate, modified somewhat by the moisture periodically entering the area from the Gulf of Mexico and the Atlantic Ocean. As a result, precipitation is greater and temperature less extreme than would otherwise be the case. Nevertheless, there is wide variation of weather patterns within the basin.

Atmospheric conditions within the basin are controlled primarily by high and low pressure systems that normally move eastward across the United States. Weather changes are frequent with high pressure systems usually bringing west to northwest winds, lower temperatures, and clearing skies, while low pressure areas normally bring southerly winds, rising temperatures, and some form of precipitation.

The average annual temperature in the Susquehanna Basin ranges from about 44 degrees in the northern part of the basin to about 53 degrees in the southern part. Average January temperatures range from 22 degrees at Montrose, Pennsylvania, to 33 degrees at York, Pennsylvania. Average July temperatures range from 66 degrees at Philipsburg, Pennsylvania, to 78 degrees at Holtwood, Pennsylvania. Extreme temperatures of 107 degrees and 39 degrees below zero have been recorded. The average annual growing season, measured by the average dates for the first and last killing frosts (28 degrees) at any place, ranges from one hundred and fifty days around Binghamton, New York, to approximately two hundred days around Harrisburg, Pennsylvania.

Average annual precipitation is about 39 inches over the entire basin and ranges from 32 inches at Wellsboro, Pennsylvania to 45 inches at Cresson, Pennsylvania. In the extreme years, over 50 inches of rainfall have been recorded in various places, and in 1972 a record total of 59.2 inches of rainfall was recorded at Harrisburg. Drought years have seldom recorded less than 25 inches at any station.

Considerable variation in the average annual snowfall is found within the basin, ranging from 28 inches at Holtwood, Pennsylvania to 85 inches at Binghamton, New York with many mountain peaks receiving well over 100 inches every winter. The greatest annual snowfall in the basin on record is 138 inches at Cortland, New York in 1961. The smallest is 8.8 inches recorded in 1937 at Harrisburg, Pennsylvania.

Winds are predominately westerly throughout the basin and average about ten miles per hour over the year. Extremes reached during hurricanes or thunder squalls have been recorded at eighty miles per hour.

7. Hydrology

Since the average annual rainfall in the basin is about 39 inches per year, this means that over fifty billion gallons per day, on the average, falls in the basin. An average of twenty-three billion gallons per day (46 percent) flows from the mouth of the Susquehanna into the Chesapeake Bay. Naturally, this flow varies from day to day and from year to year. Of particular interest are the extreme low flows and high flows, the droughts and the floods, and the flows that can be depended upon most of the time. Since the Susquehanna experiences considerable variations in flow over periods of years and during any one year, planning for the best utilization of the basin's water becomes a difficult task.

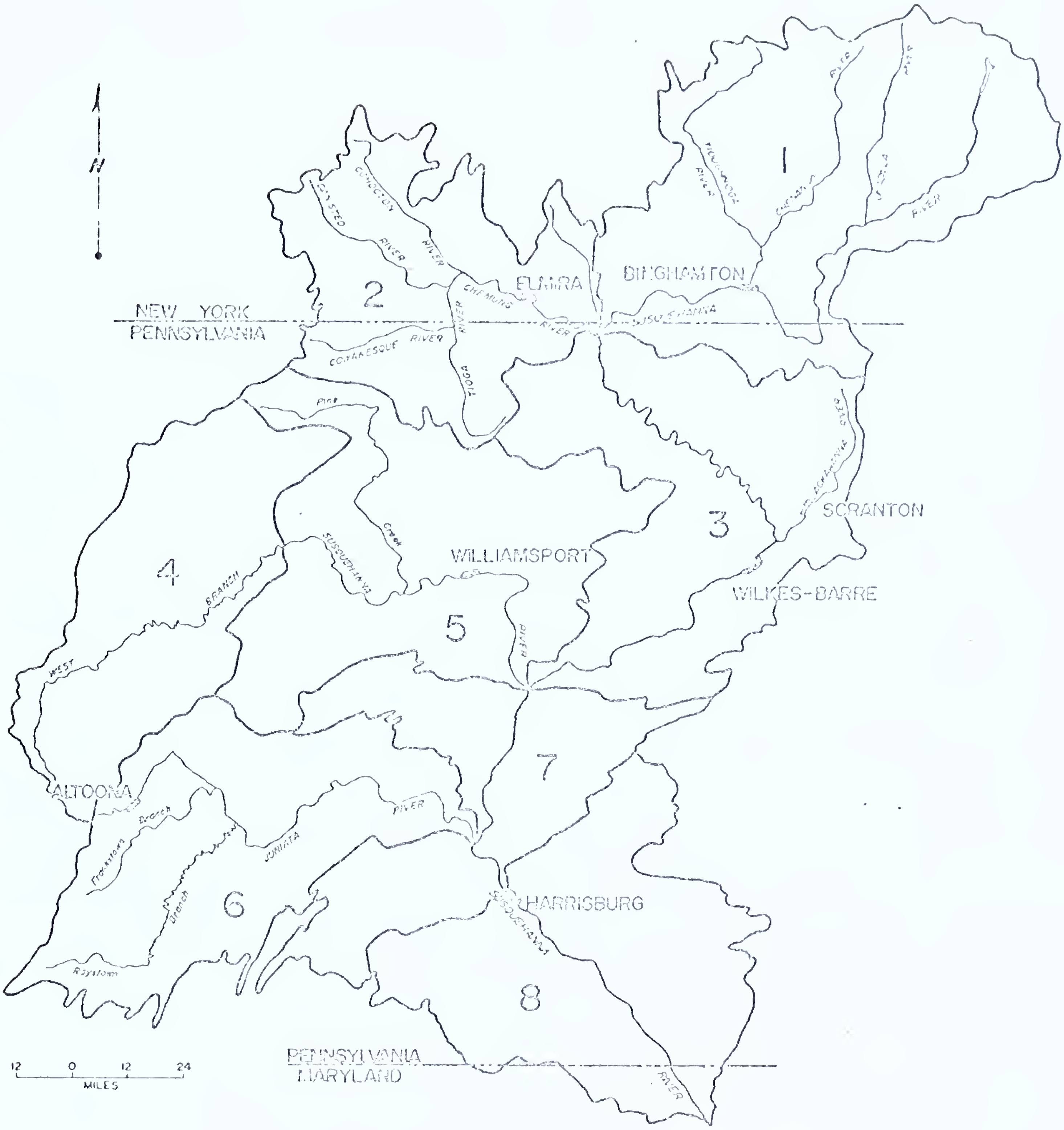
To collect and analyze hydrologic data, the Susquehanna River Basin was divided into eight hydrologic subbasins. (See Figure 11) These subbasins, their principal streams, and their drainage areas are:

Table 1

Areas of Hydrologic Subbasins

Subbasin	Drainage	Area (Sq.Mi.)
I	Susquehanna River, upstream from Athens, Pa.	4,944
II	Chemung River	2,604
III	Susquehanna River, Sayre, Pa., to Sunbury, Pa.	3,755
IV	West Branch Susquehanna River, source to Renovo, Pa.	2,975
V	West Branch Susquehanna River, Renovo, Pa., to mouth	4,017
VI	Juniata River	3,406
VII	Susquehanna River, Sunbury, Pa. to Harrisburg, Pa. (excluding Juniata River)	2,399
VIII	Susquehanna River, Harrisburg, Pa., to mouth	3,410
TOTAL	Susquehanna River Basin	27,510

Total runoff varies from year to year and from place to place. Average yearly precipitation rates generally result in fifty percent of the total water being devoted to evapotranspiration, ten percent to percolation to deep ground water source, and the remaining forty percent to a combination of surface and ground water runoff. Land use, soil, and the type of vegetative cover affect surface runoff and evapotranspiration rates. For instance, in cities with large portions of their areas paved or covered with buildings, surface runoff would approach one hundred percent; in heavily



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HYDROLOGIC SUBBASINS

FIGURE NO. 11

forested areas, surface runoff would be much lower and evapotranspiration would be correspondingly higher.

In terms of seasonal variations in average stream flow, virtually all the major streams experience their highest flows in March, April, and May, when melting snows combine with the spring rains. These three months account for about one-half of the yearly runoff. Flows are lowest in these streams during the summer and early fall months, with most streams hitting their lowest levels in September. Figure 12 shows a typical flow pattern for the basin as recorded for the Susquehanna River at Sunbury, Pennsylvania.

These flows are averages collected over long periods of time. They do not reveal periods of drought when, for a year or more, rainfall and runoff were below the averages; and they do not reveal floods that occurred on the major streams after severe regional storms, or floods that may have hit small tributaries because of local storms. It is possible for one portion of the basin to be flooded while another is experiencing a drought.

8. Floods

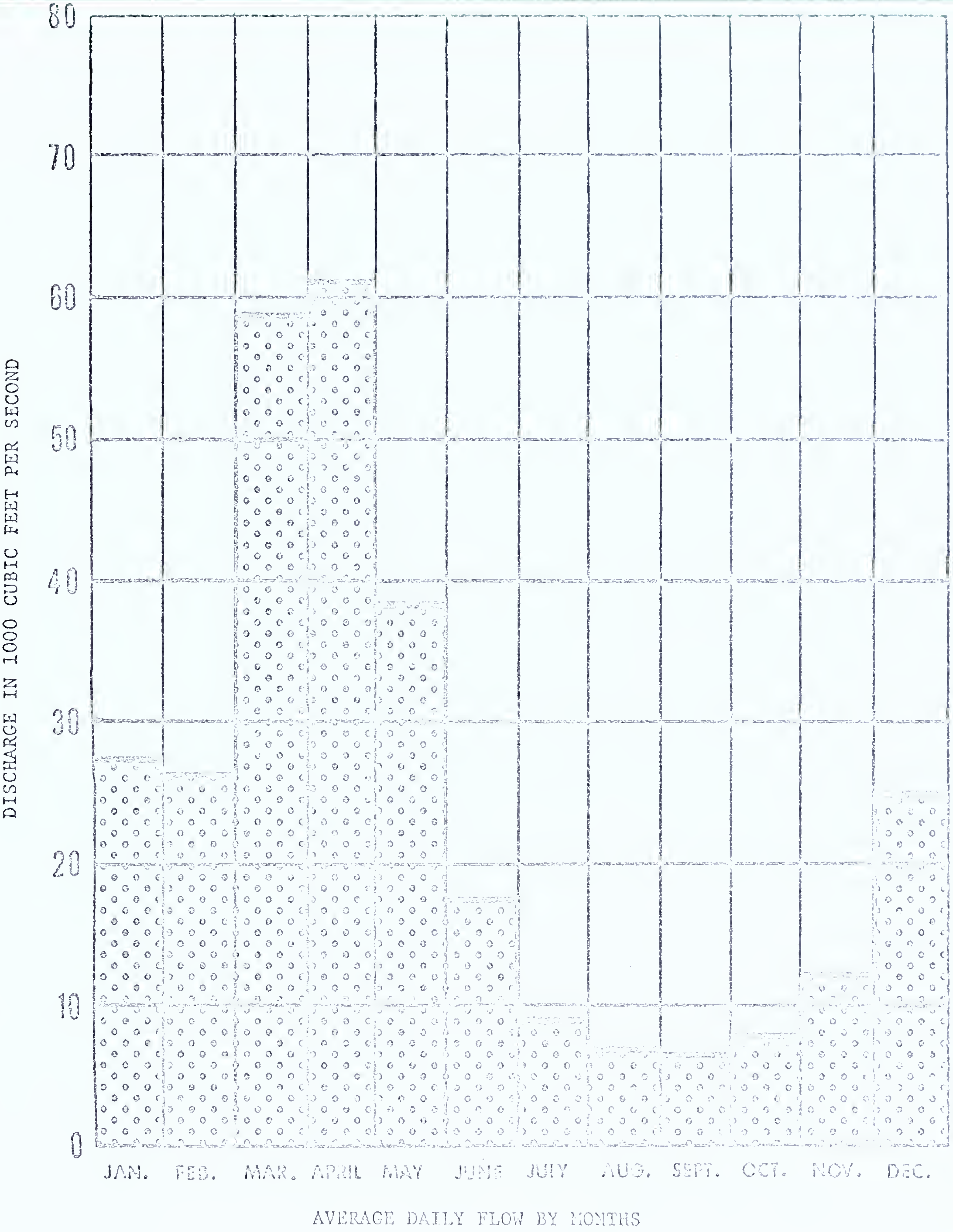
Generally, floods occur each year somewhere in the basin, and major floods can occur in all seasons of the year. The more frequent flooding, however, occurs in early spring, usually in March. Major floods have occurred as the result of heavy rainfall on top of heavy snowfall and as a result of heavy rainfall on previously saturated ground. Occasionally, local flooding is caused by ice jams. Flooding from high intensity summer storms is often aggravated by saturated ground conditions from previous storms, and flooding over small drainage areas also results from thunderstorms during the summer months. Record floods have occurred at most localities in the Susquehanna River Basin on one or more of the following dates: June 1889, July 1935, March 1936, May 1946, and June 1972.

9. Droughts

While many droughts occurred in parts of the basin at different times, the two most severe occurred in the 1930-34 period and the 1962-65 period. The drought of the 1930's left many streams dried up, and water for domestic use had to be hauled to many places. The more recent drought of the 1960's was even more severe, in terms of intensity and the greater demands on the resource. Agriculture suffered, municipalities had to restrict water use drastically, and many streams dried up or were left with poor quality water.

10. Ground Water

Most of the streams in the Susquehanna River Basin are "gaining streams", that is, water moves from the ground water reservoir to the surface streams. This condition may be reversed in some instances, and water may move from the stream to the ground water body resulting in a "losing stream".



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HISTORIC DAILY FLOW OF THE SUSQUEHANNA RIVER
AT SUNBURY, PENNSYLVANIA

Figure No. 12

Ground water may sometimes be preferable to surface waters because of its relatively uniform temperature, quantity, and quality throughout the year. Currently, one-fourth the population of the Susquehanna River Basin has been estimated to use water derived from underground sources. In addition, approximately 400 municipalities depend upon ground water for all or part of their supply. The total quantity of ground water used may be expected to increase even as major new urban supplies of surface water are developed.

Appalachian Plateau The rocks of the Appalachian Plateau have not been widely utilized as a source of water because of the easy availability of water from the glacial deposits underlying the valley floors where the urban areas are situated. There is evidence of appreciable amounts of good quality water except near coal mines. In Pennsylvania, the average potential yield is about 200 gallons per minute (gpm). In New York, the yields of wells are significantly lower with an average potential of about 60 gpm.

Valley and Ridge Province The quantity and quality of ground water differs greatly from place to place and depends mainly on local rock type. The wells in this province yield an average of 125 gpm, ranging from 20 gpm to several thousand gpm.

Piedmont and Blue Ridge Provinces Yields of wells in most of this area are generally rather low, yielding an average of about 75 gpm, but ranging from 5 gpm to 1,000 gpm depending on local rock type. Quality is generally good, although in some locations the water may be very hard.

Atlantic Coastal Plain The Atlantic Coastal Plain contains aquifers that are not potentially very productive because of their limited thickness in the basin. Yields of from 50 to 100 gpm of good quality water are possible.

Glacial Deposits Water from the glacial deposits in the northern parts of the Appalachian Plateau and Valley and Ridge Provinces is generally of good quality. Yields are low, though adequate for domestic wells in the glacial till that mantles the uplands. In the stratified sands and gravels of glacial origin that are found in the valley bottoms, yields may range up to 1,000 gpm. These glacial formations have excellent potential for recharge from surface water as a means of water storage.

11. Soils

Soil types are closely related to climate and geology. Since the climate of the Susquehanna Basin is relatively uniform, the soil types vary largely with the physiographic provinces. On the moderately sloping uplands of the glaciated portion of the plateau, the soils are developed in glacial till derived mainly from local sandstone and shale. They are deep and moderately well to poorly drained. Soils on the more strongly sloping uplands are moderately deep and usually well drained. Most of the soils contain considerable amounts of coarse fragments, frequently have stones on the surface, and are in woodland. Drainage and infiltration capacity are often restricted by a slowly permeable layer within two feet of the surface. Natural fertility is moderate to low. The stream valleys contain deep deposits of glacial valley fill materials. Soils of the sandy and gravelly outwash deposits are predominately deep and well drained. Soils formed in the finely textured valley deposits are deep and poorly drained.

In the unglaciated part of the plateau, soils are formed in materials weathered from sandstone and shale. They are mostly moderately deep to deep, and well to poorly drained. Extensive areas are stony and ledgy and natural fertility is low. This area is largely in woodland.

In the Valley and Ridge Province, soils of the ridges are developed in materials weathered from sandstone, mostly moderately deep to deep, well drained, and very stony. Soils of the lower ridge slopes are deep, moderately well to poorly drained, and very stony. Soils of the shale valleys are mostly moderately deep to shallow, well to moderately well drained, with moderate to steep slopes. Soils of the limestone valleys are predominantly deep, well drained, productive, and in cropland.

Soils of the Piedmont Province are formed in parent materials weathered from a wide variety of rocks, including red shale, schist, gneiss, quartzite, diabase, and greenstone. The ridge soils are mostly deep, well drained, and very stony. Soils formed over the shales and other softer rocks are moderately deep to deep, well to poorly drained, and generally very fertile.

12. Mineral Resources

A mineral occuring in the earth's surface becomes a mineral resource when technology makes it economical to recover. Without meeting this criterion, minerals are merely "rocks".

Coal has by far been the giant among mineral resources in the Susquehanna Basin, and will continue to be for some time. Many of the towns and cities in the basin were built for the single purpose of coal mining. While coal provided a livelihood for thousands over many decades, the operators worked without regard to conservation. The land was stripped and deep mine wastes were left in enormous piles.

Other important mineral resources of the basin include glass sand, lime, clay, trap rock, sand and gravel and stone.

SECTION II - EXISTING PUBLIC FACILITIES

Summary of Existing Public Facilities for Flood Control, Treatment of Sewage, Water Supply, Outdoor Recreation, and Electric Power Generation

A. Flood Control Works

The Susquehanna River Basin currently contains 123 existing or under construction flood control projects. The following table shows the location of these facilities by involved State. For stream and area location see Figure 4, Page 21.

Existing and Under Construction Flood Control Projects in the Susquehanna Basin

	Implementing Agencies					
State	Corps of Engineers		SCS	State		Total
	Dams	L.F.P.	Dams	Dams	L.F.P.	
New York	4	25	18	-	-	47
Pennsylvania	9	11	12	5	36	73
Maryland	-	-	3	-	-	3
Total	13	36	33	5	36	123

The Corps and State dams control an area approximately 3,660 square miles or thirteen percent of the total area of the basin. (See Appendix C) These reservoirs provide approximately 1,054,000 acre feet of flood water storage.

The local flood protection projects in the basin include levees, flood walls, pressure conduits, spoil dikes, culverts, pumping stations, and channel improvements, and are designed to pass various flood discharges.

The P.L. 566 watershed projects include conservation measures to reduce erosion and sedimentation as well as structural measures, such as dams for flood water storage, water supply, recreation, fish and wildlife enhancement, and agricultural water related purposes. The dams provide control of about 90.0 square miles of drainage area and can store approximately 14,000 acre feet of flood water.

B. Municipal Sewage Treatment Facilities

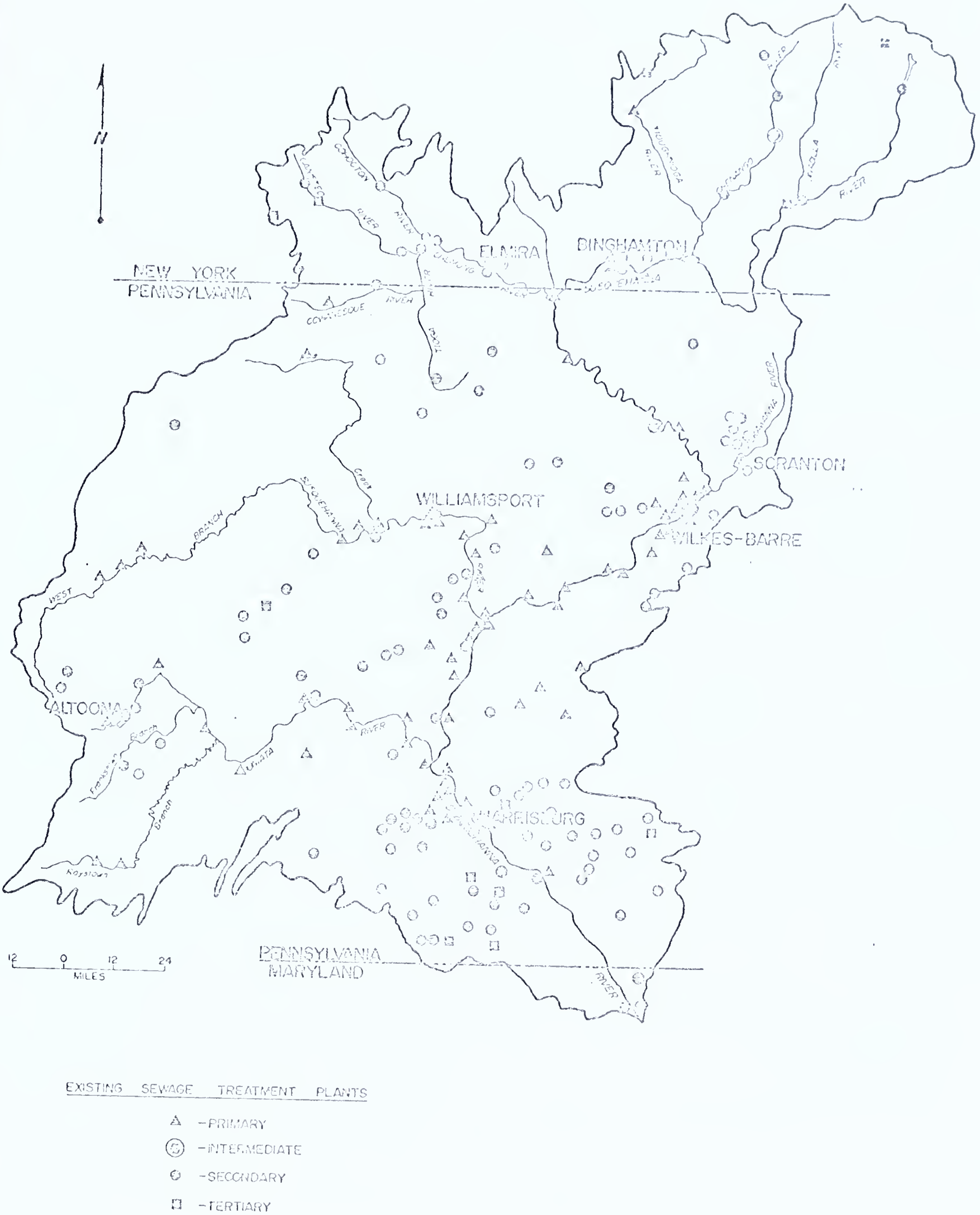
There are approximately 204 existing or under construction municipal sewage treatment plants. The location of these facilities by involved State are presented in the following table. For stream and area locations see Figure 13.

Existing Municipal Sanitary Sewage
Treatment Plants in the Susquehanna River Basin

State	Primary	Intermediate	Secondary	Tertiary	Total
New York	4	2	16	5	27
Pennsylvania	71	-	98	5	174
Maryland	-	-	3	-	3
Total	75	2	117	10	204

C. Public Water Supply Systems

There are currently 440 public water supply systems providing an estimated 344 million gallons of water per day. These systems service many industries and approximately 2,200,000 residents of the basin's total population. There are 1,400,000 people dependent on individual sources, mostly



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EXISTING AND UNDERWAY MUNICIPAL SEWAGE TREATMENT FACILITIES

FIGURE NO 13

wells, in the rural areas of the basin. The following table illustrates the location of the public water supply systems by State. For general service area location see Figure 14.

Existing Public Water Supply Systems
in the Susquehanna River Basin

State	Number of Systems	Estimated Water Use (M.G.D.)	Population Served (Thousands)
New York	98	65	593
Pennsylvania	335	276	1,600
Maryland	7	3	7
Total	440	344	2,200

D. Recreation

The rural nature of the basin provides residents with an excellent opportunity for outdoor recreation. In the basin today, there are approximately 182 public recreational complexes available for use, on approximately 1,600,000 acres of public lands and waters. These facilities range from large State parks with water oriented recreational reservoirs, fishing and boating lakes, and public access points on streams and lakes, to simple trails through Federal or State forest lands. The following table illustrates the location of the major recreational facilities by involved State.

Existing Public Recreational Facilities Available in the Susquehanna River Basin

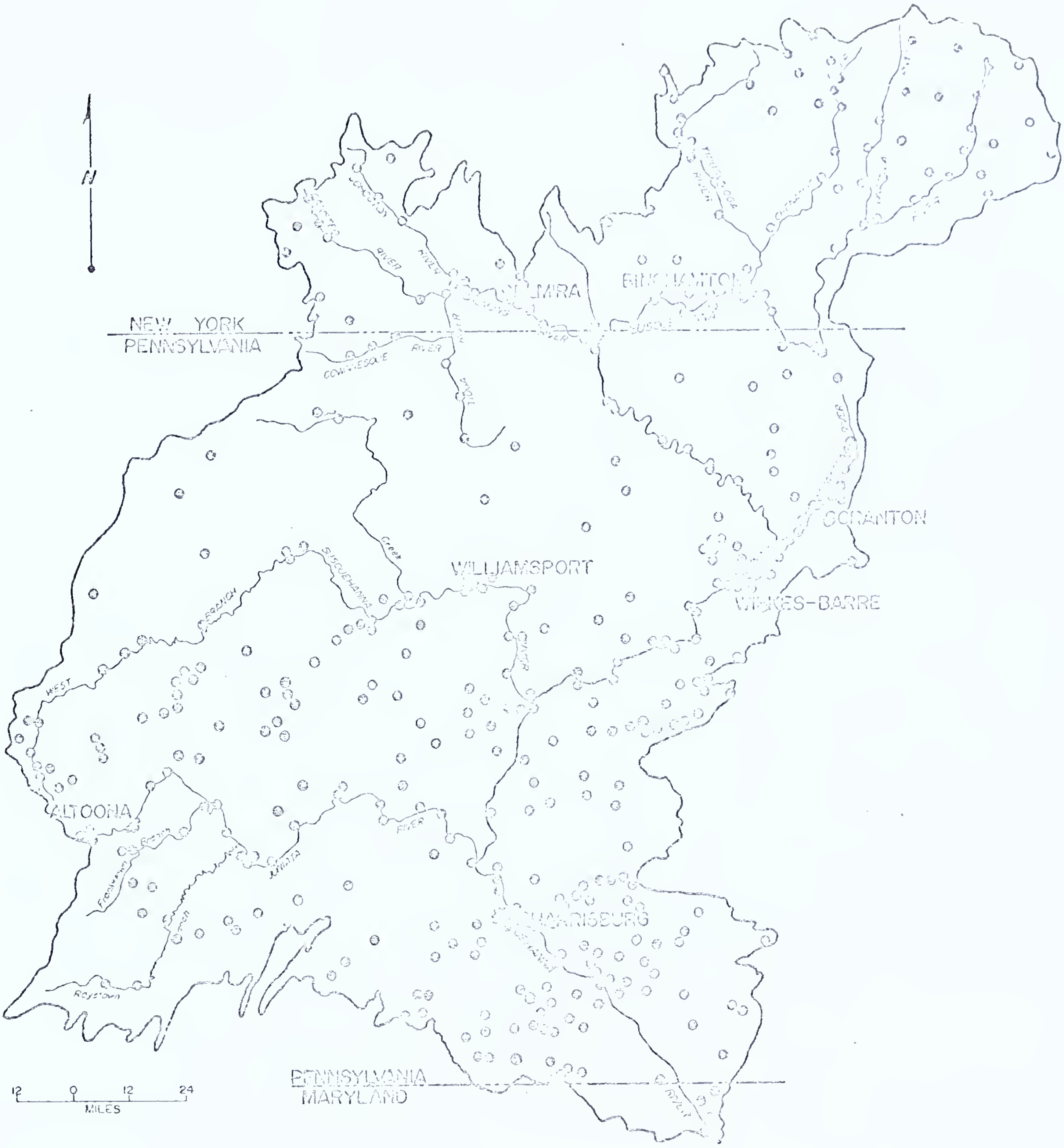
State	Number	Land	Water	Total
		(Thousands of Acres)		
New York	55	114	3	117
Pennsylvania	124	1,414	20	1,434
Maryland	3	2	1	3
Total	182	1,530	24	1,554

E. Electric Power Generation

There are three major electric power pools and a number of small utility systems serving the Susquehanna River Basin. The Pennsylvania-New Jersey-Maryland (PJM) power pool supplies the major portion of the basin's requirements and is among the oldest and largest pools in the country. There are currently thirty-six major electric generating facilities in the basin. The present total market area generating capacity is 37,800 megawatts. Of this total 6,269 megawatts are generated in the basin. Nearly all of the generating capacity is developed on the main stem of the river below Harrisburg. The following table shows the location of these facilities by involved State.

Major Existing Electric Generating Facilities in the Susquehanna River Basin

State	Hydro	Fossil Steam	Nuclear Steam	Gas Turbine &Intern. Combus.	No.	Capacity (MW)
New York	-	3	-	-	3	288
Pennsylvania	4	10	1	17	32	5,507
Maryland	1	-	-	-	1	474
Total	5	13	1	17	36	6,269



⊙ – COMMUNITIES SERVED BY PUBLIC WATER SUPPLY SYSTEMS

THE SUSQUEHANNA RIVER BASIN COMMISSION
UNITED STATES-NEW YORK-PENNSYLVANIA-MARYLAND

COMMUNITIES SERVED BY A PUBLIC WATER SUPPLY SYSTEM

FIGURE NO. 18

SECTION III - DEMOGRAPHIC AND ECONOMIC ACTIVITY

The economic, population, and employment projections presented here are based on extensive data prepared for the Water Resources Council.* Detailed projections based on a high level of growth have been completed. Preliminary projections of population have been completed for medium and low levels of growth. Further refinement of these projections will be made in conjunction with projections for medium and low levels of economic and employment growth. The Water Resources Council data was utilized as a control in the projection methodology. However, for formulation and review of specific projects, projections prepared for the project area or subbasin by local and/or State agencies will be considered and differences will be reconciled. This will allow for both national and local influence to be accounted for in the projection of demographic and economic activity.

1. Population

The 1970 population of the Susquehanna River Basin was approximately 3,600,000 people. Of this number, seventy-nine percent resided in Pennsylvania; twenty percent in New York; and one percent in Maryland. From 1930 to 1970, the basin showed an increase of about 500,000 people or an

*U.S. Water Resources Council, 1972 OBERS Projections; Regional Economic Activity in the U.S., Volumes 1-5, Washington, D.C., September 1972.

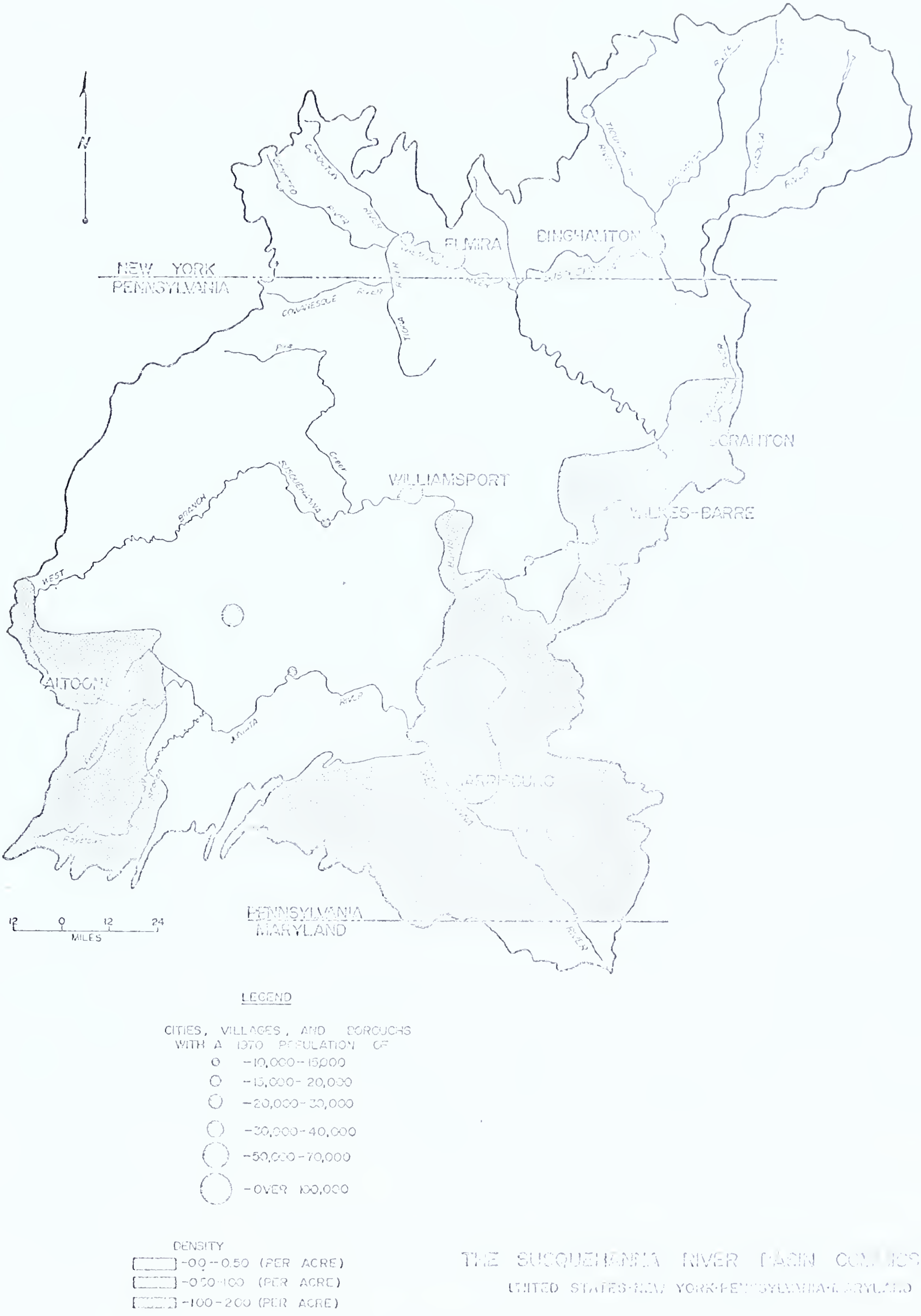
increase of approximately fifteen percent over the 40-year period. In the last decade of this period the population increased about 219,000 people or approximately six percent. (See Figure 15)

Figure 16 reflects the population changes expected under low, medium and high levels of growth. The population in the current decade, 1970 to 1980, is estimated to increase by 300,000 people or approximately eight percent, and 500,000 people or approximately fourteen percent for the low and high levels of growth, respectively. By the year 2010, the growth rates as projected would yield a range in population of 4,600,000 to 5,900,000 people. These estimates reflect an increase of twenty-one percent and sixty-eight percent, respectively for the low and high levels of growth for the 40-year period between 1970 and 2010.

The medium or most likely level of population growth to occur reflects an increase of 400,000 people, or eleven percent over the 1970-1980 decade. A 1,300,000 increase in population equaling a thirty-three percent increase is expected over the 1970-2010 period. The resulting population level at the end of this period would be approximately 5,200,000 and would increase to 5,700,000 by 2020.

2. Employment and Income

Total employment within the basin is projected to increase from the 1970 level of 1,400,000 to 1,600,000 in



THE SUSQUEHANNA RIVER BASIN COMMISSION
UNITED STATES-NEW YORK-PENNSYLVANIA-MARYLAND

1970 POPULATION CENTERS OF 10,000 OR MORE

FIGURE NO. 15
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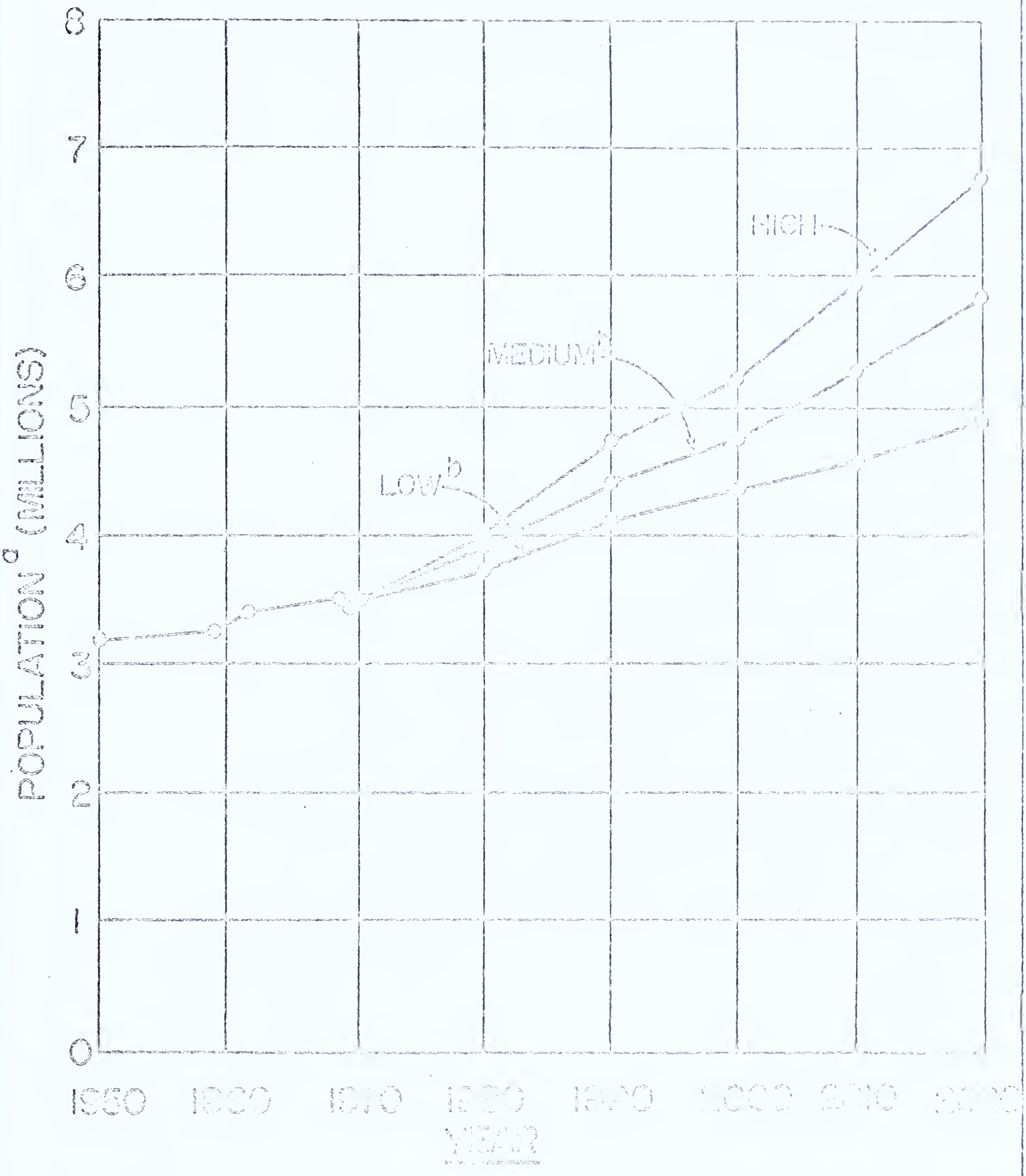

Population projections are based on data from: U.S. Water Resources Council, 1972 OBERS Projections; Regional Economic Activity in the U.S., Volumes 1--5, Washington, D.C., September 1972

Preliminary Projections

THE SUSQUEHANNA RIVER BASIN COMMISSION

UNITED STATES * NEW YORK * PENNSYLVANIA * MARYLAND

HISTORIC AND PROJECTED POPULATION

Figure No. 16

1980 and to 2,800,000 by 2020. Of these approximately thirty-eight percent (670,300) employes in 1980 and thirty-three percent (914,000 employes) in 2020 will be employed in manufacturing industries. Employment in the major water-using industries (food, chemicals, petroleum, primary metal and paper) is estimated to increase 1.6 times the 1970 level by the year 2020. The most rapid growth is expected in the paper and chemical industry.

Total personal income is projected to increase from 11 billion dollars in 1969 to 17.6 billion in 1980 and to 93 billion by the year 2020. Per capita income (1967 constant dollars) was 3,037 in 1969, and is expected to rise to 4,354 in 1980 and to 13,749 by the year 2020. This is an average annual increase of approximately seven percent. The success with which water resources of the basin are developed and managed can be expected to influence the fulfillment of these projections.

Glossary

As used within this plan, the following words and terms shall have the meanings set forth below:

agricultural water supply

Water used for farm related activities including livestock watering and irrigation and spraying of crops.

aquifers

A formation, group of formations or parts of a formation that contains sufficient saturated permeable material to yield significant quantities of water to springs and wells.

base flow

Sustained flow which is composed of ground water and delayed subsurface runoff, but not affected by surface runoff from excess rainfall.

basin

The area of drainage of the Susquehanna River and its tributaries into Chesapeake Bay to the southern edge of the Pennsylvania Railroad bridge between Havre De Grace and Perryville, Maryland.

Commission

The Susquehanna River Basin Commission.

Compact

The Susquehanna River Basin Compact which is the organic act of the Commission enacted into law by the signatory parties. Text of the act can be found in the statutes of the signatory parties at: New York Environmental Conservation Law, Sections 21-1301 et. seq. (McKinney 1972); Pennsylvania Statutes Annotated, Title 32, Sections 820.1 et. seq.; Maryland Statutes Annotated, Article 96A, Sections 59 et. seq.; and Public Law 91-575, (December 24, 1970), 84 stat. 1509.

conservation

Concept of management to prevent waste of natural resources.

consumptive use

The quantity of water discharged to the atmosphere or incorporated in the products of a process such as vegetative growth, food processing, or an industrial process.

cost

Direct and indirect expenditures, commitment, and net induced adverse effects, whether or not compensated for, used or incurred in connection with the establishment, acquisition, construction, maintenance, and operation of a project.

criteria

The basis on which a proposal can be judged or a limit which must be met to protect a resource use.

demand

The quantity of a resource or service utilized at alternative prices, other things being equal.

development

Structural measures or change of natural status for achieving certain objectives.

diversion

The transfer of water into or from the basin.

domestic water supply

Water provided for drinking, bathing, sanitary and other personal purposes.

facility

Any real or personal property, within or without the basin, and improvements thereof or thereon, and any and all rights-of-way, water, water rights, plants, structures, machinery, and equipment acquired, constructed, operated, or maintained for the beneficial use of water resources or related land uses or otherwise including, without limiting the generality of the foregoing, any and all things and appurtenances necessary, useful, or convenient for the control, collection, storage, withdrawal, diversion, release, treatment, transmission, sale, or exchange of water; or for navigation thereon, or the development and use of hydro-electric energy and power, and public recreational facilities; or the propagation of fish and wildlife;

or to conserve and protect the water resources of the basin or any existing or future water supply source, or to facilitate any other uses of any of them.

flood hazard area

An area in the flood plain which has a potential for flooding with consequent damage and/or loss of life.

flood plain

The land bordering a river, stream, or other body of water which in the past has been inundated by flood waters or can be reasonably expected to be inundated in the future.

flood plain management

Planned development and management of flood hazard areas.

flood proofing

Structural and nonstructural additions, changes, or adjustments of properties and structures, primarily for the reduction or elimination of flood damage to lands, water and sanitary facilities, structures, and content of buildings.

flood stage

That stage or elevation where overflow of the natural banks of the stream begins.

floods

A temporary rise in stream flow or stage which results in inundation of the areas adjacent to the channel.

floodway

Part of the flood plain needed to convey the 100 year flood with no significant increase (not greater than 1 foot) in the profile due to marginal confinement or impedance of flow.

100 year flood (basic flood)

A flood determined by a statistical analysis of historical flood data to have a one percent chance of ocurring in any one year.

gaging station

A particular site on a stream, canal, lake, or reservoir where systematic observations of water level or discharge are obtained continuously or periodically.

goals

Results or achievements desired and considered to be more specific than objectives.

gpm

Gallons per minute.

industrial water supply

Water used by industrial and commercial establishments.

low flow augmentation

The release of water from an impoundment or other water storage facility to increase the flow of a stream.

MGD

Millions of gallons per day.

need

A condition requiring relief.

nutrients

Substances necessary to growth and maintenance of plants and animal life. They may cause excessive enrichment of waters which results in degradation of water quality and undesirable ecological changes generally indicated by excessive rooted or water-borne plant growth and loss of water clarity.

objective

Result or achievement desired. More general than goals.

person

An individual, corporation, partnership, unincorporated association, and the like and shall have no gender, and the singular shall include the plural.

policy

A definite course of action selected from among alternatives in light of given conditions which guides determination of present and future decisions.

pollution

The introduction of substances or properties into waters of the basin which impair the uses specified in the comprehensive plan.

preservation

Protecting resources from disturbance, damage, spoiling or to limit the development of uses.

project

Any work, service, or activity which is separately planned, financed, or identified by the Commission, or any separate facility undertaken or to be undertaken by the Commission or otherwise within a specified area, for the conservation, utilization, control, development, or management of water resources which can be established and utilized independently or as an addition to an existing facility and can be considered as a separate entity for purposes of evaluation.

reach

A term to describe the linear segments of a stream or river; e.g., stream reach or river reach.

recharge

Addition of water to an aquifer by infiltration of precipitation through the soil, by seepage from streams or other bodies of surface water, by flow of ground water from another aquifer or by pumpage of water into aquifer through recharge wells; also, the water added by these processes.

regulated streams

Streams where the quantity of flow, including its distribution in time or place, are altered by the activities or works of man.

regulation

A rule or order having the effect of law issued by the Commission under the power granted or delegated to it by the Susquehanna River Basin Compact. Or, the act of regulating.

runoff

The following terms are used to describe runoff:

a) Surface runoff - That part of runoff that has not passed beneath the surface since it was last precipitated out of the atmosphere.

b) Ground water runoff - That part of runoff that has passed beneath the surface since it was last precipitated out of the atmosphere.

c) Total runoff - A term which includes ground water and surface runoff.

safe yield

The rate at which water can be withdrawn from a source of supply without causing eventual depletion or contamination of supply.

signatory party

One of four parties to the Susquehanna River Basin Compact; States of New York, Maryland, Commonwealth of Pennsylvania, or the Federal government.

supply

The quantity of a resource or service available at alternative costs, other things being equal, to satisfy a demand for a water or related natural resource.

unregulated streams

Streams where the quantity of flow, including its distribution in time or place, are not significantly altered by the activities or works of man.

water quality

The characteristics of water as determined by any given combination of chemical, physical and biological properties.

waters

Both surface and underground waters which are contained within the drainage area of the Susquehanna River in the States of New York, Pennsylvania and Maryland.

withdrawal

Taking or removal of water from any source within the basin for use within the basin.

yield

The quantity of water which can be obtained from a source for a specified period of time.

APPENDIX A

Areas Where Flood Plain Management Measures Would Reduce Future Flood Losses

Appendix A

AREAS WHERE FLOOD PLAIN MANAGEMENT MEASURES WOULD REDUCE FUTURE FLOOD LOSSES

SUBBASIN I - Eastern Susquehanna River

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES)			
		*Intensive	Light	Minimum	Total
a) Unadilla	New Berlin to Mouth	1.7	5.8	10.5	18.0
b) Tioughnioga	Cortland to Mouth	7.2	11.0	10.8	29.0
c) Chenango	Norwich Area	14.7	13.3	2.0	30.0
	Norwich to Mouth	10.8	5.7	34.0	50.5
	Mouth of the Tioughnioga to Binghamton	3.4	6.5	5.4	15.3
d) Susquehanna	Oneonta to Sidney	6.6	4.6	11.1	22.3
	Sidney to Binghamton	9.8	12.3	42.8	64.9
	Binghamton to Athens	10.0	3.8	-	13.8
Total		64.2	63.0	116.6	243.8

SUBBASIN II - Chemung River

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES)			
		Intensive	Light	Minimum	Total
a) Cohocton	Bath to Corning	6.8	6.7	1.8	15.3
	Twelve Mile Creek to Bath	.9	2.5	9.1	12.5
b) Canisteo	Addison to Mouth	2.1	1.9	2.5	6.5
	North Hornell to Canisteo	3.4	.8	4.7	8.9
c) Cowanesque	Proposed Dam to Mouth	-	2.3	.9	3.2
d) Tioga	Lawrenceville to Mouth	1.5	9.3	4.2	15.0
e) Chemung	Corning to Mouth	11.0	16.7	2.3	30.0
Total		25.7	40.2	25.5	91.4

SUBBASIN III - North Branch

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES)			
		Intensive	Light	Minimum	Total
a) Susquehanna	Towanda Area	3.2	.9	-	4.1
	Meshoppen Area	.9	.9	-	1.8
	Tunkhannock Area	1.3	3.8	-	5.1
	Laceyville Area	.7	3.3	-	4.0
	Mehoopany Area	.2	1.7	-	1.9
	Wyalusing Area	.5	1.4	-	1.9
	Mouth of the Lackawanna River to Sunbury	30.7	19.0	14.3	64.0
b) Lackawanna	Stillwater Dam to the Mouth	27.8	6.4	5.8	40.0
Total		65.3	37.4	20.1	122.8

SUBBASIN IV -West Branch (Source to Renovo, Pennsylvania)

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES)			
		Intensive	Light	Minimum	Total

(NO AREAS DELINEATED)

SUBBASIN V - West Branch (Renovo, Pennsylvania to Sunbury, Penna.)

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES)			
		Intensive	Light	Minimum	Total
a) West Branch	Westport to Hyner	1.5	6.0	4.5	12.0
	Lock Haven to Mouth	11.9	10.9	41.4	64.2
b) Pine Creek	Entire	6.0	44.0	22.0	72.0
c) Lycoming	Mouth Area	3.4	6.4	-	9.8
d) Loyalsock	Mouth Area	-	8.9	-	8.9
e) Muncy	Mouth Area	11.9	3.0	-	14.9
Total		34.7	79.2	67.9	181.8

SUBBASIN VI - Juniata River

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES) Intensive	Light	Minimum	Total
a) Little Juniata	Altoona Area	2.7	2.1	-	4.8
b) Bald Eagle Cr.	Tyrone Area	.9	.2	-	1.1
c) Juniata	Lewistown to Mouth	4.0	6.8	31.2	42.0
Total		7.6	9.1	31.2	47.9

SUBBASIN VII - Lower Susquehanna (Sunbury, Pa. to Harrisburg, Pa.)

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES) Intensive	Light	Minimum	Total
a) Susquehanna	Duncannon to Hbg.	7.2	3.2	4.8	15.2
b) Conodoguinet	Source to Mouth	1.5	14.7	82.8	99.0
c) Wiconisco	Millersburg Area	.8	-	-	.8
	Lykens Area	1.3	-	-	1.3
d) Yellow Breeches	Source to Mouth	1.3	8.1	44.6	54.0
Total		12.1	26.0	132.2	170.3

SUBBASIN VIII - Lower Susquehanna (Harrisburg, Pa. to Mouth)

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES) Intensive	Light	Minimum	Total
a) Susquehanna	Hbg. to Maryland	10.9	18.9	33.9	63.7
	Susquehanna State Pk.	-	-	3.0	3.0
	Port Deposit	2.0	-	-	2.0
	Havre De Grace	2.0	-	-	2.0
	Perryville	2.1	-	-	2.1

SUBBASIN VIII - (Continued)

RIVER OR STREAM	AREA	EXISTING DEVELOPMENT (MILES)			
		Intensive	Light	Minimum	Total
b) Codorus	Indian Rock Dam to Mouth	3.8	2.0	6.2	12.0
c) Swatara	Pine Grove to Mouth	4.4	10.8	41.8	57.0
d) Conestoga	Lancaster Area	7.2	3.8	-	11.0
e) Chickies	Manheim Area	2.7	-	-	2.7
Total		35.1	35.5	84.9	155.5

SUMMARY

MAJOR BASIN	CRITICAL FLOOD PLAIN AREAS EXISTING DEVELOPMENT (MILES) Intensive	Light	Minimum	Total	Mileage of Major Rivers & Streams in Basin**	% of the Critical Areas of the Total
Eastern	64.2	63.0	116.6	243.8	578	42
Chemung	25.7	40.2	25.5	91.4	280	33
N. Branch	65.3	37.4	20.1	122.8	508	24
West Branch (Source to Renovo, Pa.)	-	-	-	-	438	-
West Branch (Renovo, Pa. to Sunbury, Pa.)	34.7	79.2	67.9	181.8	447	41
Juniata	7.6	9.1	31.2	47.9	375	13
Lower Mainstem (Sunbury, Pa. to Hbg., Pa.)	12.1	26.0	132.2	170.3	416	41
Lower Mainstem (Hbg., Pa. to Mouth)	35.1	35.5	84.9	155.5	518	30
Total	244.7	290.4	478.4	1013.5	3560	
Percentage	24	29	47	100		28

* Intensive Development - Highly urbanized areas
Light Development - Suburban fringe areas.
Minimum Development - Rural land use areas.

**Any river or tributary that contains more than 100 square miles of drainage area.

APPENDIX B

Areas Being Mapped Under The Flood Insurance Mapping Program

APPENDIX B

Areas Being Mapped Under The Flood Insurance Mapping Program

Mapping Area	Areas Included
New York	
Binghamton, Broome County	Vestal Town
	Endicott Village
	Union Town
	Binghamton City
	Dickinson Town
	Conklin Town
	Johnson City Village
	Kirkwood Town
	Port Dickinson Village
Owego, Tioga County	Owego Village
	Owego Town
Hornell, Steuben County	Hornell City
	North Hornell Village
Erwin, Steuben County	Erwin Town
	Corning Town
Corning-Elmira, Steuben-Chemung Co.	Elmira City
	Big Flats Town
	South Corning Village
	Corning City
	Riverside Village
	Painted Post Village
	Chemung Town
	Ashland Town
	Wellsburg Village
	Southport Town
Pennsylvania	
Athens-Sayre, Bradford County	Athens Borough
	Sayre Borough
Wyoming Valley, Luzerne County	Plymouth Township
	Nanticoke City
	Hanover Township
	Plymouth Borough
	Larkesville Borough
	Edwardsville Borough
	Kingston Borough
	Swoyersville Borough
	Luzerne Borough
	Forty Fort Borough
	W. Wyoming Borough
	Wilkes-Barre City

Mapping Area	Areas Included
	Plains Township
	Wyoming Borough
	W. Pittston Borough
	Exeter Borough
	Pittston City
	Pringle Borough
	Jenkins Township
Shickshinny, Luzerne County	Shickshinny Borough
	Conyngham Township
Danville, Montour County	Danville Borough
	Mahoning Township
	Upper Augusta Township
	Point Township
	Riverside Borough
Sunbury, Northumberland County	Monroe Township
	Shamokin Dam Borough
	Sunbury City
	Northumberland Borough
Renovo, Clinton County	Renovo Borough
	South Renovo Borough
Bellefonte, Centre County	Spring Township
	Bellefonte Borough
	Milesburg Borough
Jersey Shore-Lock Haven, Clinton-Lycoming County	Jersey Shore Borough
	Dunstable Township
	Porter Township
	Pine Creek Township
	Mill Hall Borough
	Lock Haven City
	Castanea Township
	Flemington Borough
Williamsport-Muncy, Lycoming County	Montgomery Borough
	Muncy Borough
	Montoursville Borough
	Loyalsock Township
	Williamsport City
	S. Williamsport Borough
	Duboistown Borough
	Old Lycoming Township
Lewisburg, Union County	West Chillisquaque Township
	Point Township
	Lewisburg Borough
	East Buffalo Township
	Kelly Township
	Buffalo Township
Gilberton, Schuylkill County	Gilberton Borough
Huntingdon, Huntingdon County	Huntingdon Borough
	Smithfield Township

Mapping Area	Areas Included
Mount Union, Huntingdon County	Mount Union Borough
	Mapleton Borough
	Kistler Borough
Lewistown, Mifflin County	Lewistown Borough
	Burnham Borough
	Granville Township
	Derry Township
Harrisburg, Dauphin County	Royalton Borough
	Middletown Borough
	Highspire Borough
	Steelton Borough
	New Cumberland Borough
	Wormleysburg Borough
	Harrisburg City
	West Fairview Borough
	Dauphin Borough
	Hummelstown Borough
	Susquehanna Township
	E. Pennsboro Township
	Camp Hill Borough
	Hampden Township
	Marysville Borough
	Derry Township
	S. Hanover Township
	Lower Swatara Township
	Fairview Township
	Lower Allen Township
Lebanon, Lebanon County	Lebanon City
	West Lebanon Township
	Cleona Borough
	Annville Township
York, York County	Springettsbury Township
	N. York Borough
	York City
	Spring Garden Township
Maryland	
Port Deposit-Havre De Grace, Harford-Cecil County	Port Deposit Town
	Havre De Grace City
	Perryville Town

APPENDIX C

Percentage of Susquehanna River Basin That Would Be Controlled With The Existing And Recommended Reservoirs In the Comprehensive Plan

Appendix C

Percentage of the Susquehanna River Basin that would be controlled with the Existing and Recommended Reservoirs in the Comprehensive Plan.

Subbasin and Community Location	Existing	Existing and Recommendation No. 2	Existing and Recommendations Nos. 2 and 3
Eastern Basin			
Binghamton	9	10	14
Entire Subbasin	7	8	11
Chemung Basin			
Corning	5	40	46
Elmira	4	33	40
Entire Subbasin	4	30	37
North Branch			
Towanda	6	15	19
Wilkes-Barre	5	12	16
Entire Subbasin	4	11	14
West Branch			
Lock Haven	30	30	30
Williamsport	24	24	24
Entire Subbasin	20	20	20
Susquehanna River at Sunbury	10	14	16
Juniata Basin			
Lewistown	37	37	37
Entire Subbasin	28	28	28

Subbasin and Community Location	Existing	Existing and Recommendation No. 2	Existing and Recommendations Nos. 2 and 3
Lower Main Stem			
Harrisburg	12	15	16
Entire Susquehanna River Basin	11	13	15

APPENDIX D

Projects Recommended for Immediate Study

Appendix D

Projects Recommended for Immediate Study

Truxton Dam - (Corps of Engineers)

The Corps of Engineers proposal indicates that the Truxton Dam would control about 100 square miles of drainage area, and would have flood control effect as far down river as Binghamton. It would provide major protection to Cortland and Marathon, New York. This project is an alternative to the Fabius Project recommended in the Susquehanna River Coordinating Committee Study.

Marathon Local Flood Protection Project - (Corps of Engineers)

The channel improvement project is located in Marathon, Cortland County, New York. The town of Marathon is subjected to almost annual flooding from the Tioughnioga River. The project is included in the Early Action Plan of the Susquehanna River Basin Coordinating Committee Study. The project proposal includes several alternative approaches to providing local flood protection through various channel clearance and deepening actions and/or replacement of a bridge which reduces channel discharge capacity.

Mud (Sonora) Creek Reservoir - (Corps of Engineers)

This project was recommended in the Coordinating

Committee Study for flood control on the Cohocton River, for recreation, and possibly for water supply in the Corning and Elmira areas. It is located near the mouth of Mud Creek, which is a tributary of the Cohocton River. It would offer additional flood protection on the Chemung River at Corning and Elmira.

Five Mile Creek Reservoir - (Corps of Engineers)

The Five Mile Creek Dam was recommended in the Coordinating Committee Study for further analysis. It is located near the mouth of Five Mile Creek, which is a tributary of the Cohocton River. It would provide flood protection on the Cohocton River at Bath, New York, and limited additional protection on the Chemung River at Corning and Elmira.

Clark Creek Watershed - (SCS)

This watershed project is for flood and erosion control. It includes a single purpose flood control reservoir and a channel improvement project. The project would provide flood protection for Oxford, Chenango County, New York.

Mill Brook Watershed - (SCS)

The proposed project is located near New Berlin, Chenango County, New York and includes one single purpose flood control reservoir, one multipurpose flood control-recreation reservoir and minor channel improvements.

Trout Brook Watershed - (SCS)

The proposed project was recommended in the Susquehanna River Basin Commission Coordinating Committee Study. It is located near McGraw in Cortland County, New York, and includes one single purpose flood control reservoir and one multiple purpose flood control recreation reservoir.

Dundaff Creek Watershed - (SCS)

The Soil Conservation Service has demonstrated that this watershed project would be feasible under the P.L. 566 program. It would protect the town of Clifford, Susquehanna County, Pennsylvania, from flooding by Dundaff Creek.

Nescopeck Creek - (SCS)

The structural measure authorized for Nescopeck Creek watershed in Pennsylvania is a multiple purpose flood control recreation reservoir. This reservoir will control 33.2 square miles of drainage area, and will create an 830 acre recreation lake. The structure will provide flood protection benefits along Nescopeck Creek to its junction with Little Nescopeck Creek.

Bull Run Watershed - (SCS)

The Bull Run Watershed Project consists of all drainage which makes up the small stream known as Bull Run at Lewisburg, Pennsylvania, where flood damages have been intense and rather frequent. This watershed has been given high priority by the Pennsylvania State Soil and Water Conservation Commission. Justification for the high priority afforded Bull Run stems directly from Hurricane Agnes flood disaster.

Wiconisco Creek Watershed - (SCS)

The Wiconisco Creek Watershed is located in the Lykens Valley, Pennsylvania, and the watershed project would be designed primarily to protect Lykens. The need for a project here was emphasized by the Hurricane Agnes flood disaster.

Chickies Creek Watershed - (SCS)

The need for a Chickies Creek Watershed project was identified by the Coordinating Committee Study of 1970, but was reemphasized by the Hurricane Agnes flood disaster at Manheim, Pennsylvania. This project would consist of one or more dams upstream of Manheim designed to control floods at Manheim.

Upper Tioga River Watershed - (SCS)

The structural measure proposed for the Tioga River in Pennsylvania is a multi-purpose flood control and water supply reservoir. This reservoir will control 57.9 square miles of drainage area. The structure will provide flood protection and water supply benefits along the Tioga River downstream to Mansfield, Pennsylvania.

Harrisburg Local Flood Protection Project - (Corps of Engineers)

A local flood protection project to protect Harrisburg, Pennsylvania, from floods on the Susquehanna River and Paxton Creek was identified in the Coordinating Committee Study of 1970. After the June 1972 flood, the Corps restudied the plan and submitted a 3-part proposal as follows:

a. Flood control on Paxton Creek through storage dams on Paxton Creek and Asylum Run, and improved discharge to the Susquehanna River at low or normal river stages.

b. Protection works at Mouth of Paxton Creek to prevent Susquehanna River from backing up the creek at high river stages.

c. Levee or flood wall protection for Harrisburg against high Susquehanna River flows.

Wyoming Valley Local Flood Protection Project - (Corps of Engineers)

This is a local flood protection project to increase protection for the Wyoming Valley, Luzerne County, Pennsylvania, from floods on the Susquehanna River. After the June 1972 flood, the Corps restudied the area and submitted a proposal for consideration to all interests. This proposal includes the raising of three highway bridges and the modifications of two railroad bridges; raising the existing walls and levees by approximately five feet; and increasing the pumping capacity for the interior drainage system.

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